ANALYSIS OF THE JACKKNIFE METHOD USING STRAIGHT AND ANTITHETIC REALIZATIONS FROM A COMPUTER SIMULATION

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THESIS

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ABSTRACT

In many situations it is important to have a continuous flow of supplies from a storage point to a consumer. Often, though, queues develop and the flow of supplies is interrupted. To investigate these queue problems the statistics concerning various queue properties may be studied by computer simulation. To obtain accurate statistical information many realizations for each queue property must be obtained. Because of this, it may be costly to use queue simulations and computers to study these problems. However, by using straight-forward and antithetic sampling techniques in a queue simulation, the number of realizations needed to obtain accurate confidence interval estimates for the population standard deviation (σ_p) was reduced. By using a combination of ten straight and ten corresponding antithetic realizations, repeated testing of confidence intervals determined by both the jackknife and chi-square procedures showed that the predicted percentage of coverage of σ_p for the various queue properties could be obtained to a satisfactory approximation.

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I. INTRODUCTION

In many everyday situations problems of service, and delays for service, arise. A few examples of these problems are:

1. customers entering and leaving check-out stands in a grocery store,

2. automobiles arriving and passing through an intersection, and

3. telephone calls arriving at and being completed in a telephone exchange.

Queuing situations and problems also arise in naval operations, particularly in logistics and communications. When a queue problem exists, the analysis of the statistics concerning the various measures of effectiveness, or properties of queues, such as the waiting time of the $i^{\underline{th}}$ customer, becomes very important. These statistics for the various properties can be obtained from models of queues by two methods:

1. the use of mathematical expressions derived from the models, or

2. the use of computers and queue simulations based on the models.

Both of these methods of obtaining statistics have disadvantages. The closed form mathematical expressions that are derived from very simple queue models are generally very complex, even though the queue models are so over-simplified that the information obtained from the analytical expressions may be of little or no value. Because many "real-life" queueing problems are not simple enough to be analyzed accurately by this method, computers and queue simulations are used. However, complex queue simulations often require many repetitive operations to obtain a single realization of a queue property; hence, this method of obtaining statistical information is very time-consuming and expensive. The purpose of

this thesis is to obtain accurate information concerning the properties of queues using very few realizations of a queue development. By doing this, the expense involved in running queue simulations could be reduced.

To accomplish the purpose of this thesis a queue simulation program and two statistics programs were developed. The queue simulation program was developed so that straight and antithetic realizations could be obtained on the following queue properties, chosen as illustrative examples:

1. the waiting time of the fifth customer,
2. the average waiting times of the first five customers, and
3. the maximum waiting time of the first five customers who had to wait.

Statistical programs were developed to analyze the accuracy with which confidence intervals, computed by means of the following two statistical procedures,

1. the jackknife procedure, and
2. the chi-square procedure,

"covered" the population standard deviation (σ_p) of the above three queue properties.

A. STRAIGHT AND ANTITHETIC REALIZATIONS

The queue simulation program was concerned with events occurring in a random manner, and repeated sampling of these events was necessary to obtain accurate estimates of the various queue properties. In this simulation two methods of sampling events were used:

1. straight-forward sampling, and
2. antithetic sampling.

Since events in the simulation occurred in a random manner, the program made use of a pseudo random numbers generated directly from the pseudo random number generator were known as <u>straight</u> pseudo random numbers. To

sample using the antithetic technique, an antithetic pseudo random number, R', was computed as follows:

$$R' = 1.0 - R;$$

the antithetic pseudo random numbers that were computed were used like the straight pseudo random numbers, R. All the realizations based on the straight pseudo random numbers were called straight realizations, and those based on antithetic pseudo random numbers were called antithetic realizations. The straight and corresponding antithetic realizations were not independent. However, each straight realization was independent of and identically distributed with respect to all the other straight realizations and each antithetic realization was independent of and identically distributed with respect to all the other antithetic realizations. Hence, by using these two methods of sampling simultaneously, two non-independent realizations were obtained by using the pseudo random number generator only once.

B. THE METHOD OF ESTIMATING

The queue simulation program generated 4000 realizations on each of the three queue properties. In each set of 4000 realizations, 2000 were straight and 2000 were antithetic realizations. To obtain an accurate estimate of the population standard deviation (σ_p) for each queue property, an accurate estimate ($\bar{\sigma}_p^2$) of the population variance (σ_p^2) for each property was first determined. The variance for the 2000 straight realizations ($\bar{\sigma}_s^2$) for each property was averaged with the variance for 2000 corresponding antithetic realizations ($\bar{\sigma}_a^2$),

$$\bar{\sigma}_p^2 = (\bar{\sigma}_s^2 + \bar{\sigma}_a^2)/2.$$

Hence, an accurate estimate of the population standard deviation is the square root of the estimate of the population variance,

$$\bar{\sigma}_p = \sqrt{\bar{\sigma}_p^2}.$$

For all practical purposes, $\bar{\sigma}_p = \sigma_p$; therefore, for the remainder of this thesis, $\bar{\sigma}_p$ will be replaced by σ_p.

C. ROBUSTNESS OF THE t- AND CHI-SQUARED STATISTICS

To be able to compute accurate confidence interval estimates of the population standard deviation (σ_p), two requirements must be met when the usual statistical procedures are invoked:

1. there must be enough data compiled on each of the queue properties, and
2. the data must tend to be normally distributed.

The second of these two requirements must be met because the theory for the two statistical procedures that are commonly used to compute confidence interval estimates,

1. the use of the t-statistic and
2. the use of the chi-squared statistic,

is based on the data that is normally distributed. However, the t-statistic is a fairly robust statistic in that deviations from normality often do not seriously affect the accuracy of the results; but the chi-squared statistic is not likely to be robust and data that is not normally distributed may seriously affect the accuracy of the results. The robustness and non-robustness of the t- and chi-squared statistics are more thoroughly described in the book, Introduction to Statistical Theory, by P. G. Hoel, S. C. Port, and C. J. Stone on pages 181 to 185, and in other publications in the statistical literature.

II. DESCRIPTIONS OF THE COMPUTER PROGRAMS

A. THE QUEUE SIMULATION PROGRAM

The particular queuing process that was programmed was characterized by

1. independently and exponentially distributed interarrival times,
2. independently and identically distributed service times,
3. service in arrival order (first-in, first-out or FIFO),
4. the first arrival in the queue has no waiting time ($W_1 = 0$), and
5. there is only one server and the queue has no length limit.

A queue simulation was written based on the above assumptions and generated 2000 straight and 2000 corresponding antithetic realizations for each of the following queue properties:

1. the waiting time of the fifth customer,
2. the average waiting times of the first five customers, and
3. the maximum waiting time of the first five customers who had to wait.

The equations that were used to generate these realizations were:

1. waiting time of the $n^{\underline{th}}$ customer:

$$W_{n+1} = W_n + S_n - A_{n+1} \qquad \text{if } S_n - A_{n+1} > 0$$

$$= 0 \qquad \text{if } S_n - A_{n+1} \leqq 0$$

Where S_n is the service time of the $n^{\underline{th}}$ customer and A_{n+1} is the time between the arrival of customer n and n+1.

2. average waiting times of the first n customers:

$$AW_n = \frac{1}{n} \sum_{i=1}^{n} W_i$$

3. maximum waiting times of the first n customers who had to wait:

$$MW_n = W_i \qquad \text{if } W_i \geqq W_j \text{ for all}$$

i and j such that $1 \leqq = i \neq j \leqq n$.

This simulation was run for two different states of queue input characteristics, and for each state the inverse traffic intensity (expected value of the interarrival times/expected value of the service times) was set at approximately 0.90. The two states of input characteristics were:

1. EXP/EXP Case

   a. The interarrival times for each customer were exponentially distributed.

   b. The service times for each customer were exponentially distributed.

2. EXP/CONS Case

   a. The interarrival times for each customer were exponentially distributed.

   b. The service time of each customer was constant.

This simulation program also calculated the expected value and variance for each of the queue properties for each state of queue input parameters. Figure 1a, page 40, gives the statistics for the exp/exp case using all 2000 straight and 2000 antithetic realizations, while Figure 1b, page 41, gives the statistics for the same case using only the non-zero realizations. Figure 2a, page 43, gives the statistics for the exp/cons case utilizing all the 2000 straight and antithetic realizations, while Figure 2b, page 44, gives the statistics using only the non-zero realizations. The statistics for the distributions for the service times and the interarrival times were also computed. Figure 3, page 39, gives the statistics for the exp/exp case, and Figure 4, page 42, gives the statistics for the exp-cons case.

B. THE STATISTICS PROGRAM

The straight and antithetic realizations for the three queue properties were used in the statistics programs to calculate confidence intervals for the population standard deviation (σ_p) of the various properties. See page 9 for the method of determing σ_p. Both of the statistics programs

1. the jackknife program, and
2. the chi-square program

used either straight realizations or a combination of straight and antithetic realizations of a queue property to calculate confidence intervals for the respective σ_p's. Each program calculated confidence intervals to cover σ_p by a predicted (or theoretical) amount; the jackknife program calculated 60, 70, 80, 85, 90, 95, 98 and 99 percent confidence intervals and the chi-square program calculated 80, 90, 95, 98 and 99 percent confidence intervals. Using these confidence intervals, the actual percentage of coverage of σ_p for each property was determined in the following manner:

1. Both the jackknife program (using the t-statistics) and the chi-square program determined upper and lower limits (UL and LL respectively) for confidence intervals.

2. Given that A had the value of σ_p for a queue property; if this value of A was such that

$$LL \leq A \leq UL$$

the computed confidence interval "covered" σ_p.

3. The number of times that a confidence interval covered σ_p was registered in an array, DCL, and the number of confidence intervals tested at a given level of percentage of coverage was registered in the

variable NTC. (The number of confidence intervals tested at any given percentage of coverage was equal to that tested at any other percentage of coverage; therefore, a single variable, NTC, was used to register this value. An array, DCL, was used to register the number of times σ_p was covered because the number of confidence intervals that covered σ_p at any one level of percentage of coverage was not necessarily equal to that at any other level of coverage.)

4. The actual percentage of coverage of σ_p was calculated by the following formula:

$$APC = (DCL/NTC) \cdot 100\%.$$

For each percentage of coverage the value of APC was subtracted from the theoretical percentage of coverage to obtain the difference between the actual and theoretical percentages of coverage. The statistics programs also calculated the expected value of the upper and lower limits of the confidence intervals and the expected value and variance of the confidence interval widths. At most, 200 confidence intervals were calculated for each queue property using only straight realizations, whereas 200 confidence intervals were calculated for each queue property using a combination of straight and antithetic realizations. (Preliminary investigation showed that the minimum number of confidence intervals tested for each queue property using only straight realizations was about 195.) Hence, the results of coverage and the statistics for the confidence intervals were based on about 200 trials.

1. <u>The Jackknife Program</u>

a. Jackknifing

Given that there were ten realizations of a queue property,

$$r_1, r_2, r_3 \cdots r_{10}.$$

To jackknife this sample to obtain pseudo values to be used as estimates for the standard deviation of the population, the following method was used:

1. First the standard deviation for the total sample was obtained:

$$s_{all} = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(r_i - \bar{r})^2} \qquad \text{where}$$

$$\bar{r} = \frac{1}{N}\sum_{i=1}^{N} r_i$$

N = 10 and i - 1, 2, 3, ... N.

2. Next, ten standard deviations for the above sample were obtained by deleting one realization from the ten and computing the sample standard deviation on the remaining nine realizations:

$$s_j = \sqrt{\frac{1}{n-1}\sum_{i=k}^{n}(r_i - \bar{r}'_j)2} \qquad \text{where}$$

$$\bar{r}'_j = \frac{1}{n}\sum_{i=k}^{n} r_i \qquad \text{for } n = N-1,$$

$$k = \begin{cases} 1 \text{ if } j \neq 1 \\ 2 \text{ if } j = 1, \end{cases} \qquad \text{and}$$

$$i = 1, 2, 3, \ldots j-1, j+1, \ldots n.$$

3. Next, ten pseudo values were formed from the eleven sample standard deviations as follows:

$$y_j = N \cdot s_{all} - n \cdot s_j \qquad \text{for } N = 10$$

n = N - 1, and j = 1, 2, ... N.

Each of these ten pseudo values (y_j) are approximately unbiased estimates of the population standard deviation. Hence, from one sample of ten

realizations, ten unbiased estimates of σ_p were formed. A more detailed description of the jackknife method is given in the article, "Data Analysis, Including Statistics," by Mosteller and Tukey on pages 133 to 141 of The Handbook of Social Psychology, Vol. II, Second Edition (Addison-Wesley).

b. Use of the t-Test

The pseudo values that were formed by the jackknife method were used as inputs to the t-test. Upper and lower limits (UL and LL respectively) for confidence intervals about σ_p were formed in the following manner: (As an example, a 95% confidence interval about σ_p will be constructed.)

1. Since each confidence interval that was constructed was based on ten pseudo values, nine degrees of freedom were used in the t-test.

2. For a 95% confidence interval with nine degrees of freedom, the t-statistic percentage point is

$$t_1 = 2.262.$$

3. The variance and the expected value of the ten pseudo values were calculated as follows:

$$s_y^2 = \frac{1}{N-1} \sum_{i=1}^{N} (y_i - \bar{y})^2 \qquad \text{where}$$

$$\bar{y} = \frac{1}{N} \sum_{i=1}^{N} y_i \qquad \text{and } N = 10$$

4. The confidence interval limits were calculated as follows:

$$UL = \bar{y} + t_1 \cdot \sqrt{s_y^2/N}$$

$$LL = \bar{y} - t_1 \cdot \sqrt{s_y^2/N}$$

c. Methods of Combining the Straight and Antithetic Realizations

When both straight and antithetic realizations were used to calculate upper and lower limits for confidence intervals, the following method was used to combine the pseudo values:

1. First, ten pseudo values were formed using only the straight realizations:

$$y_j = N \cdot s_{all} - (N - 1) \cdot s_j \quad \text{where}$$

$N = 10$ and $j = 1, 2, \ldots N$.

2. Next, ten pseudo values were formed using only the antithetic realizations:

$$y_j' = N \cdot s_{all}' - (N - 1) \cdot s_j' \quad \text{where}$$

$N = 10$ and $j = 1, 2, \ldots N$. (Note: the method of calculating s_{all}' and s_j' is the same as that used for calculating s_{all} and s_j on page 15.)

3. The two sets of pseudo values were then averaged:

$$ay_j = (y_j + y_j')/2.$$

These ten averaged pseudo values were then used with the t-statistic to calculate upper and lower limits for σ_p.

d. Methods of Improving the Coverage of σ_p

Two methods were used to try to improve the coverage of σ_p by the jackknife method:

1. the subsets of data were modified, and
2. the jackknifed data (s_{all} ', s_j, s_{all}', and s_j') was transformed before the pseudo values were calculated. (A set of data was considered to be either 2000 straight or 2000 antithetic realizations, and a subset of data was a group of ten realizations taken from a set of data.)

(1) Four Modifications Used on the Subsets.

1. ORIG (Original) -- This modification did nothing to the data in the subsets; these realizations were grouped into n groups, and the grouped data was transformed before the pseudo values were calculated. The two transformations that were used were the cube root (Wilson-Hilferty) and the logarithm.

2. REDF (Reduce Degrees of Freedom) -- This modification was the same as ORIG; however, for each pseudo value that was equal to another, the degrees of freedom used in the t-test were reduced by one. That is, if there are ten different pseudo values, nine degrees of freedom were used; if there were only eight different pseudo values in the ten pseudo values, three must be equal, and only seven degrees of freedom were used in the t-test.

3. DELZ (Delete Zero Values) -- The zero values in the subsets of realizations were removed and the subsets were reduced in number. (Note: this modification was used only when one type of realizations was being used.)

4. SCAN (Replace Zero Values) -- The zero values in each of the subsets of realizations were replaced with non-zero values between zero and the minimum non-zero value.

(2) The Three Transformations Used on the Jackknifed Data.

1. No Transformation -- The grouped data formed from the modified data subsets was used to compute pseudo values. This transformation leads to jackknifing the sample standard deviation itself.

2. Cube Root Transformation -- The cube root of the statistics computed from the grouped data was used to form pseudo values. This transformation leads to jackknifing the cube root of the sample standard deviation. The

following equation was used to form the pseudo values:

$$y_j = N \cdot \sqrt[3]{s_{all}} - n \cdot \sqrt[3]{s_j} .$$

3. The Natural Logarithm Transformation -- The natural log values of the grouped data were used to form pseudo values. This transformation leads to the jackknifing of the logarithm of the sample standard deviation. The following equation was used to form the pseudo values:

$$y_j = N \cdot \log(s_{all}) - n \cdot \log(s_j).$$

For a more complete description of the above transformations, refer to pages 138-141 of the article, "Data Analysis, Including Statistics," by Mosteller and Tukey.

2. The Chi-Squared Program

a. Use of the Chi-squared Test

The realizations obtained from the queue simulation program were used as inputs for the chi-square test to form upper and lower limits for the confidence intervals on σ_p. The confidence intervals about σ_p were formed in the following manner:

1. Since each confidence interval that was constructed in this program was based on ten realizations, nine degrees of freedom were used in the chi-square test.

2. For a 95% confidence interval with nine degrees of freedom, the chi-squared statistic percent points that were used were:

$$\chi_1^2 = 2.70$$

$$\chi_2^2 = 19.0$$

3. The variance of the ten realizations was computed using the following equations:

$$s_r^2 = \frac{1}{N-1} \sum_{i=1}^{N} (r_i - \bar{r})^2 \qquad \text{Equ 1}$$

$$\bar{r} = \frac{1}{N} \sum_{i=1}^{N} r_i \qquad \text{where } N = 10.$$

4. (Since $\bar{r}$ estimated μ, the population mean of the ten realizations, and s_r^2 is an unbiased estimate of the population variance of the ten realizations, then if the $\bar{r}$'s are normally distributed,

$$\frac{(N-1)\cdot s^2}{\sigma^2} = \frac{\sum_{i=1}^{N} (r_i - \bar{r})^2}{\sigma^2},$$

has the chi-square distribution with N-1 degrees of freedom.) The confidence interval limits were calculated using the following equations:

$$UL = \sqrt{\frac{(N-1)\cdot s_r^2}{\chi_1^2}}$$

$$LL = \sqrt{\frac{(N-1)\cdot s_r^2}{\chi_2^2}}$$

b. The Method of Combining Straight and Antithetic Realizations

When both straight and antithetic realizations were used together, the following method of combining the realizations was used:

1. Given that there were ten straight realizations on a queue property

$r_1, r_2 \ldots r_{10}$ and ten corresponding

antithetic realizations

$$r_1', r_2' \cdots r_{10}'.$$

Both the variance for the straight realizations (s_r^2) and the variance for the antithetic realizations ($s_r^{2'}$) were calculated using equation Equ 1 on page 20.

2. The variance used in the chi-square test, with N-1 degrees of freedom, was computed as follows:

$$cs_r^2 = (s_r^2 + s_r^{2'})/2.$$

III. GRAPHS OF THE QUEUE PROPERTY REALIZATIONS

Twelve exponential plots (one for each set of data) were used to investigate the data generated by the queue simulation program and used in the two statistics programs. Only the non-zero values of the first 100 realizations in each set of realizations were used to make each plot. The (x,y) coordinates for each point were calculated as follows:

1. Given that there were 80 non-zero realizations for a given sample of data

$$r_1, r_2, \ldots r_N, \qquad \text{where } N = 80.$$

These realizations were ordered such that

$$r_{(1)} \leqq r_{(2)} \leqq \ldots \leqq r_{(N)} .$$

2. Next, to generate the exponential scores (the Y-axis coordinate values) the following equation was used:

$$y_{(i)} = - \ln \frac{N + 1 - i}{N + 1} \quad , \qquad \text{where}$$

$i = 1, 2, \ldots N$ for $N = 80$. (The minus sign was used to place the graphs in the first quadrant.)

3. The ordered realizations and the exponential scores were paired so that

$$P_{(i)} = r_{(i)}, y_{(i)}) \qquad \text{for } 1 \leqq i \leqq N.$$

It was noted from the plots that

1. The straight realizations for the exp/exp queue parameter case tended to be exponentially distributed for all three queue properties.

2. The antithetic data for the exp/exp queue parameters generally deviated from an exponential distribution. The general upward curvature implied that these realizations might be roughly Weibull distributed. Given that y(x) is characterized by the following probability density function:

$$y(x) \backsim a \cdot e^{-(bx)^m}, \text{ where a, b, and m are}$$

constants, then y(x) is Weibull distributed. With m = 1,0 the Weibull distribution is an exponential distribution; however, in the plots for the antithetic variables the upward curvature implied that m =1.0. A Weibull distribution with m = 1.0 roughly approximates a normal distribution.

3. The plots for both the straight and antithetic data for the exp/cons queue parameters tended to have the upward curvature. Hence, both the straight and antithetic data for this case might be similar to that from a Weibull distribution.

IV. SUMMARY OF RESULTS

The statistics on the coverage of σ_p and the statistics on the confidence intervals show that it is more advantageous to combine straight data than to use just straight data alone. The statistics also show that when both straight and antithetic data are used, the chi-squared confidence intervals generally covered σ_p a higher percentage of the time than did the jackknife-t-test confidence intervals. Examination shows that for our examples the chi-squared procedure somewhat over-covered σ_p, i.e., was conservative. The use of straight and antithetic data in place of straight data alone tended to reduce both the confidence interval widths and the variance of the confidence interval widths when the jackknife method was used. However, for the chi-squared method, the confidence interval widths were increased slightly while the variance of these widths was reduced. In general, the variance of the confidence interval widths was three to four times greater for the jackknife method than for the chi-square method. Also, the confidence interval widths given by the jackknife method tended to be slightly wider than those given by the chi-square method. Except for the fact that the upper limits of the confidence intervals based on the logged jackknife data were markedly reduced, there seemed to be no shifting of the confidence intervals when both straight and antithetic data were combined. Thus, both the jackknife and the chi-square confidence intervals seem to cover σ_p better because of the decrease in the variance of the confidence interval widths; the better coverage of σ_p by the chi-square confidence intervals seems to be associated with the relatively smaller variance of the chi-square confidence interval widths.

Even though the combination of straight and antithetic data improved the coverage of σ_p by the jackknife method, the actual coverage using data from the exp/exp case was generally less than the coverage predicted by the t-test. However, for the exp/cons data the actual coverage was usually greater than that predicted by the t-test. The two factors that seem to be associated with this difference in coverage were:

1. the type of distribution the data seemed to fit, and
2. the variance of the population.

In general, the exp/cons data seemed to fit a Weibull distribution with $m > 1.0$ (refer to section III for information concerning the data and the plots for the data). This factor tended to make the distribution for the data look normal; hence, one would expect the chi-square sqare statistics and the t- statistics to be more accurate.

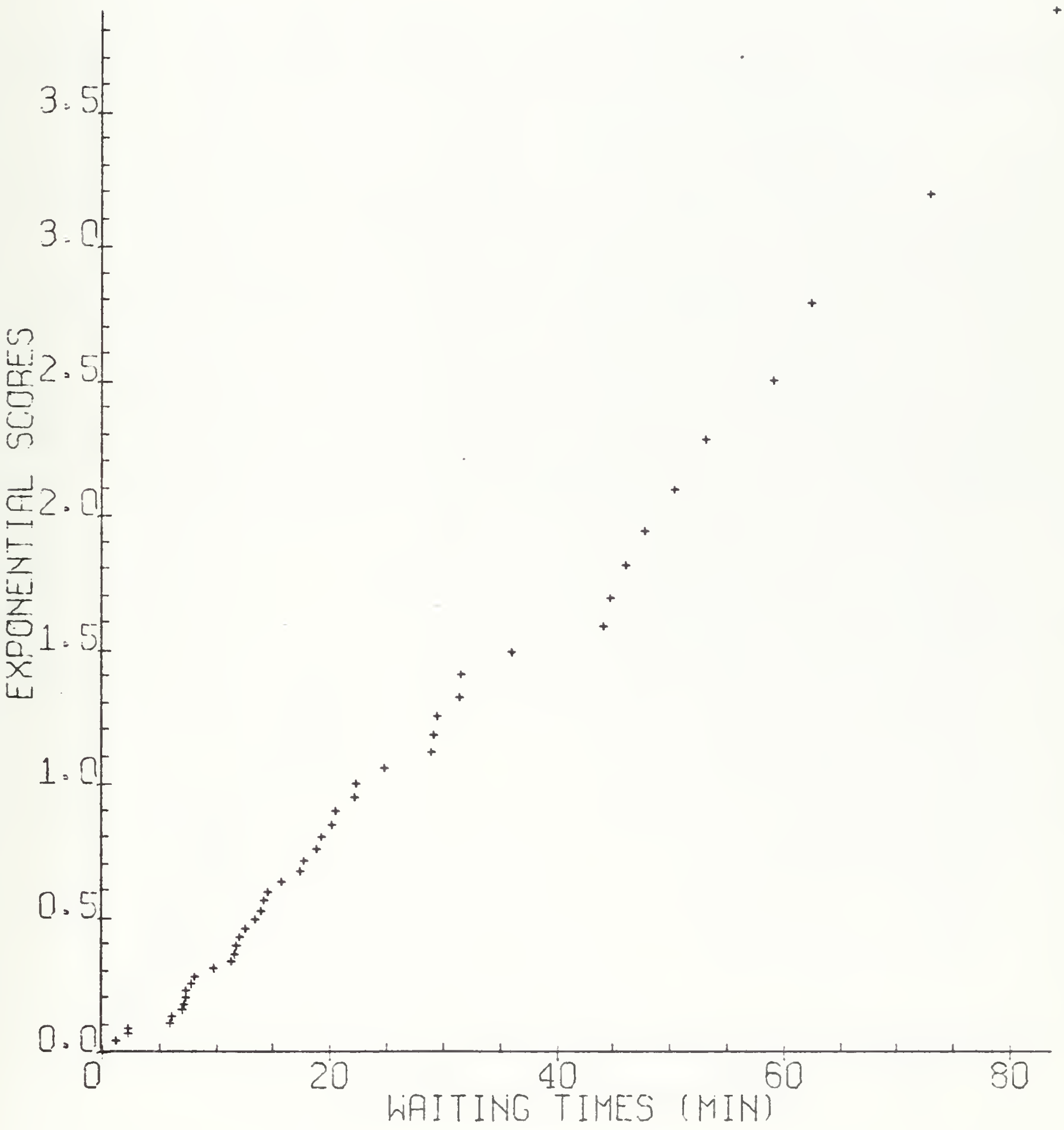
The population variances for the three measures of effectiveness for the exp/exp case were generally three to three and a half times larger than the corresponding variances of the exp/cons case. This difference in population variance affects both the confidence interval widths and the variance of these widths, no matter whether the straight or straight and antithetic data were used. In general, the increase in confidence interval widths was about two to three times the increase in population variance; however, the increase in the variance of the confidence interval widths was about ten to thirty times the increase in population variance. Hence, the coverage of σ_p seemed to be dependent not only on the distribution of the data but also the population variance.

When using the chi-square procedure, excellent coverage of σ_p was obtained only when straight and antithetic data were combined. When only straight data was used, the coverage of σ_p was much lower than given by

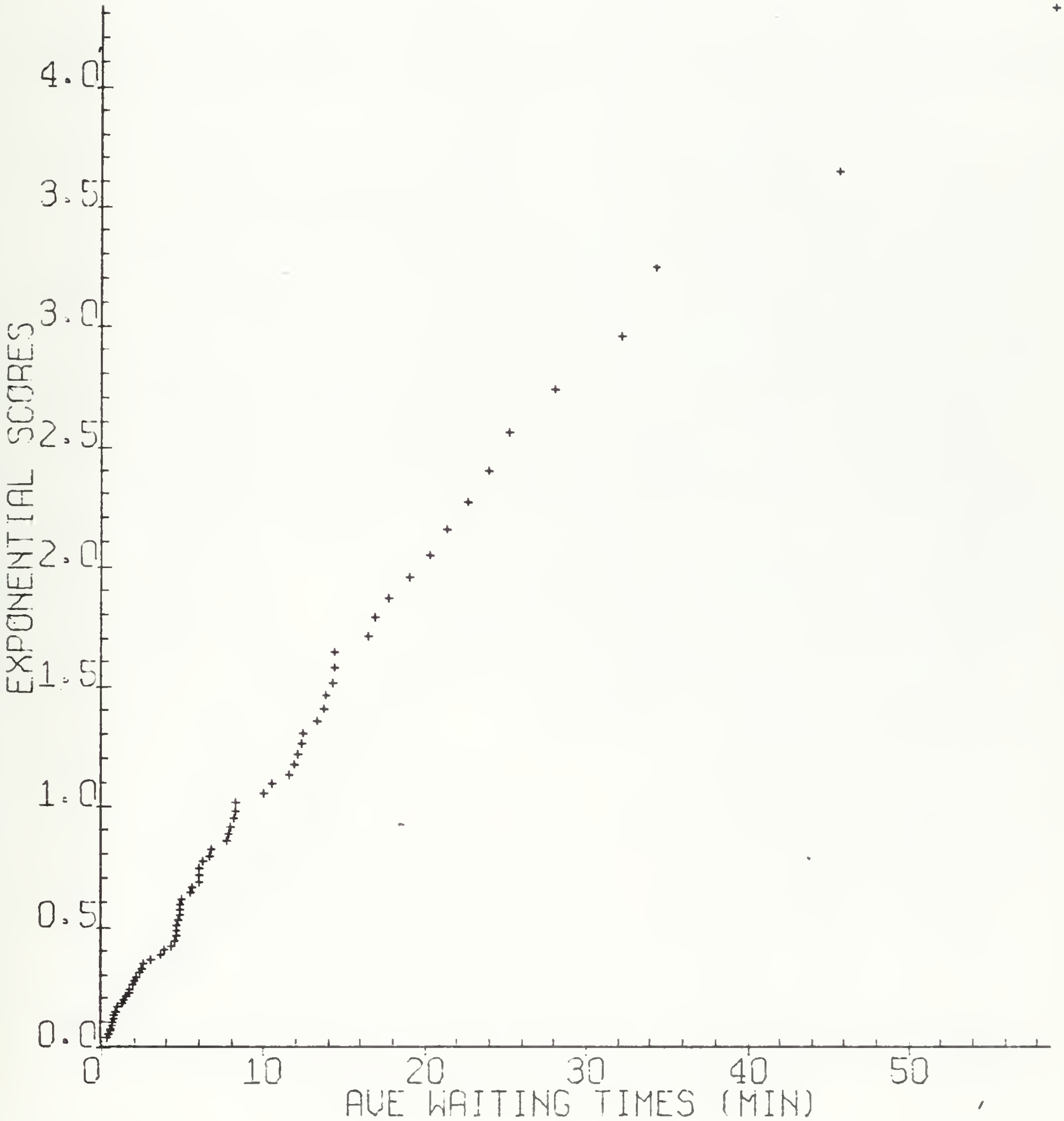
the chi-square tables. This observation tended to uphold the fact that the chi-square procedure was usually non-robust. When both straight and antithetic data were used the chi-square confidence intervals tended to be a little larger than those from the jackknife method; also, this combination of data tended to shift the chi-square confidence intervals slightly upward.

Hence, using the results tabulated in Appendices B, C, D, and E, one would tend to favor using a combination of both straight and antithetic data to place confidence intervals about σ_p. By using as few as ten realizations (ten straight and ten antithetic), the population variance can generally be well estimated with an interval estimate. By doing this, the cost of complex computer simulations can be reduced.

EXPONENTIAL PLOT OF THE
STRAIGHT DATA FOR THE WAITING
TIMES OF THE FIFTH CUSTOMER
(EXP/EXP QUEUE PARAMETERS)



EXPONENTIAL PLOT OF THE STRAIGHT
DATA FOR THE AVERAGE WAITING TIMES
OF THE FIRST FIVE CUSTOMERS
(EXP/EXP QUEUE PARAMETERS)



EXPONENTIAL PLOT OF THE STRAIGHT
DATA FOR THE MAXIMUM WAITING TIMES
OF THE FIRST FIVE CUSTOMERS
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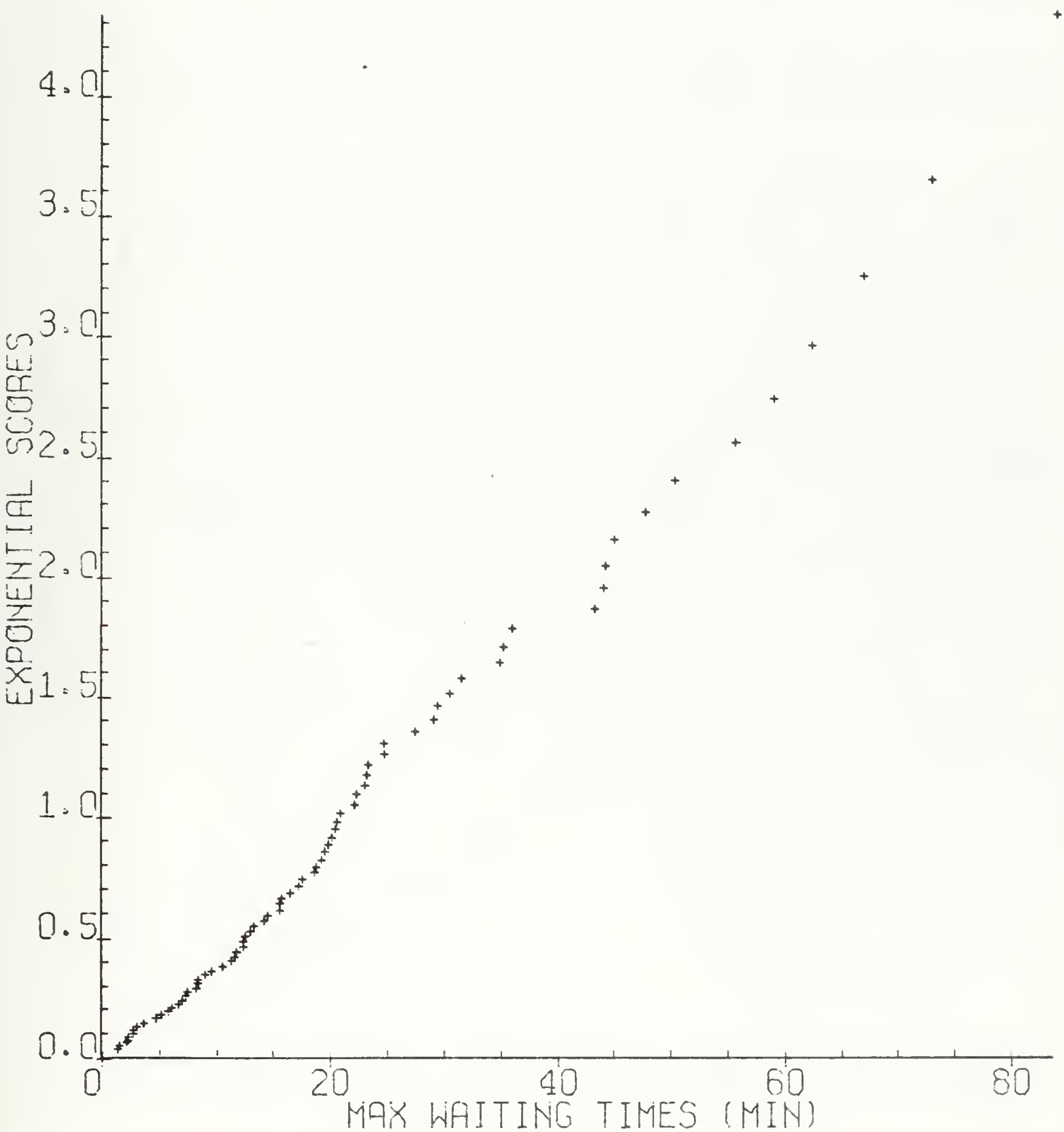
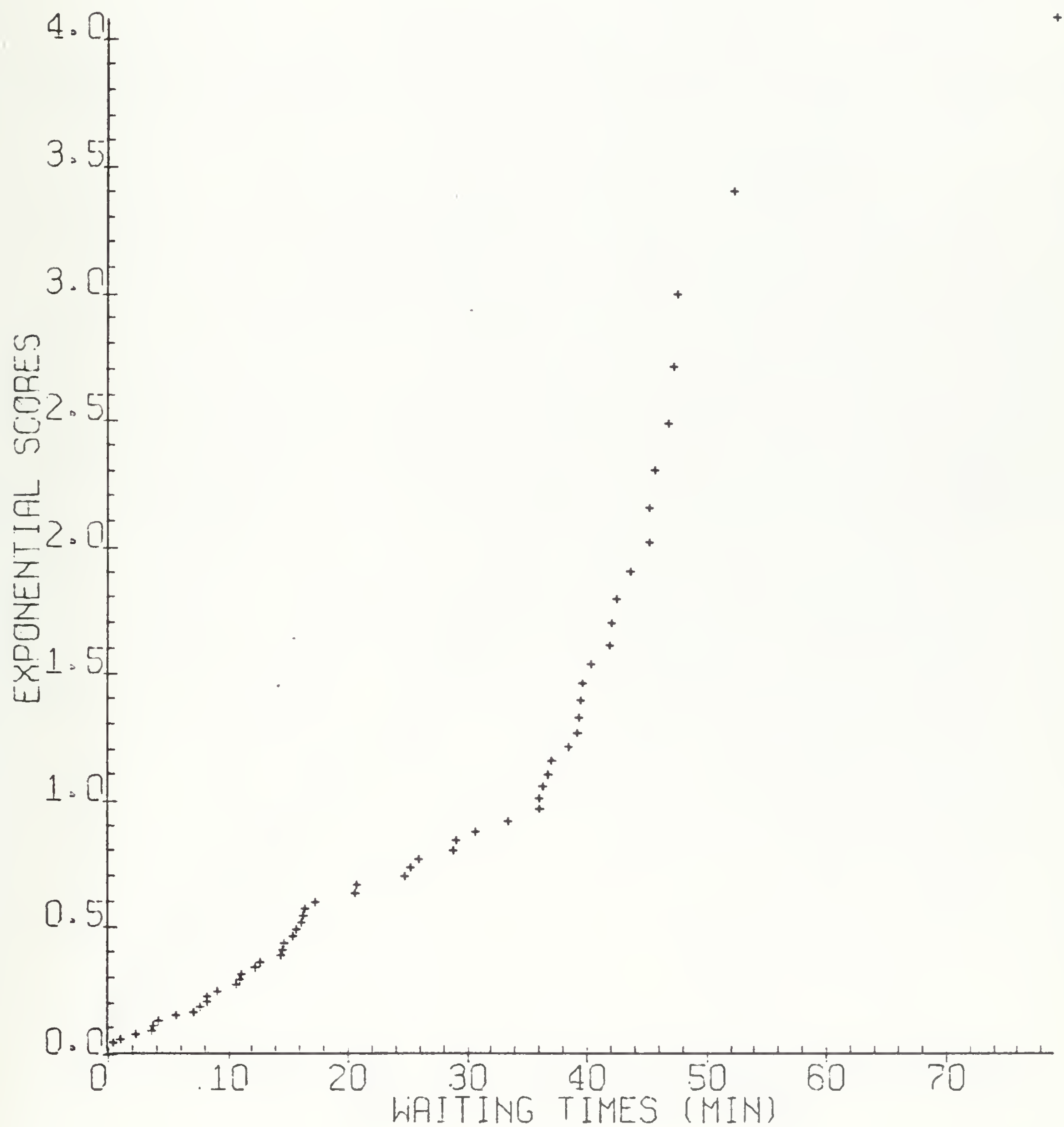
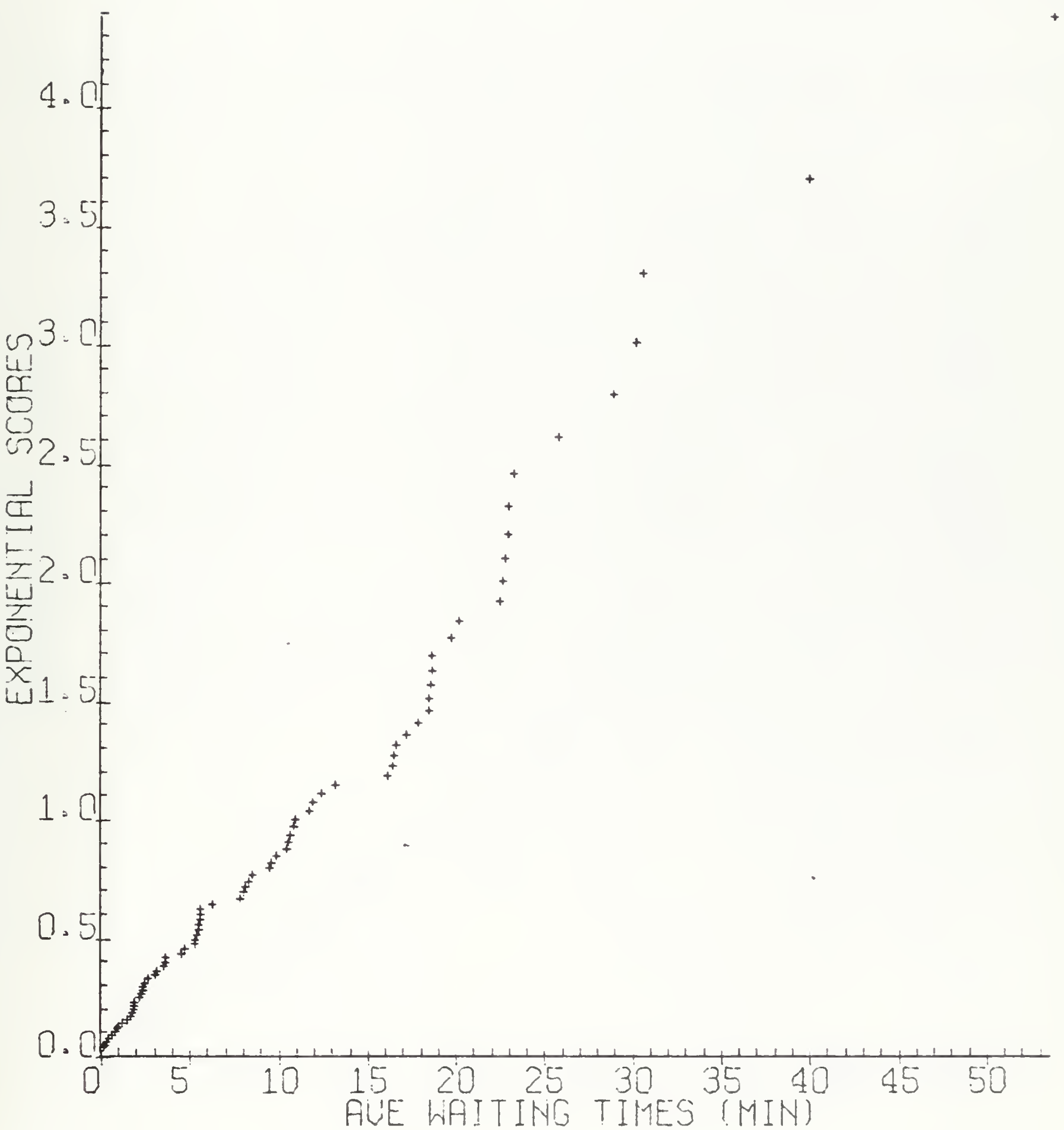


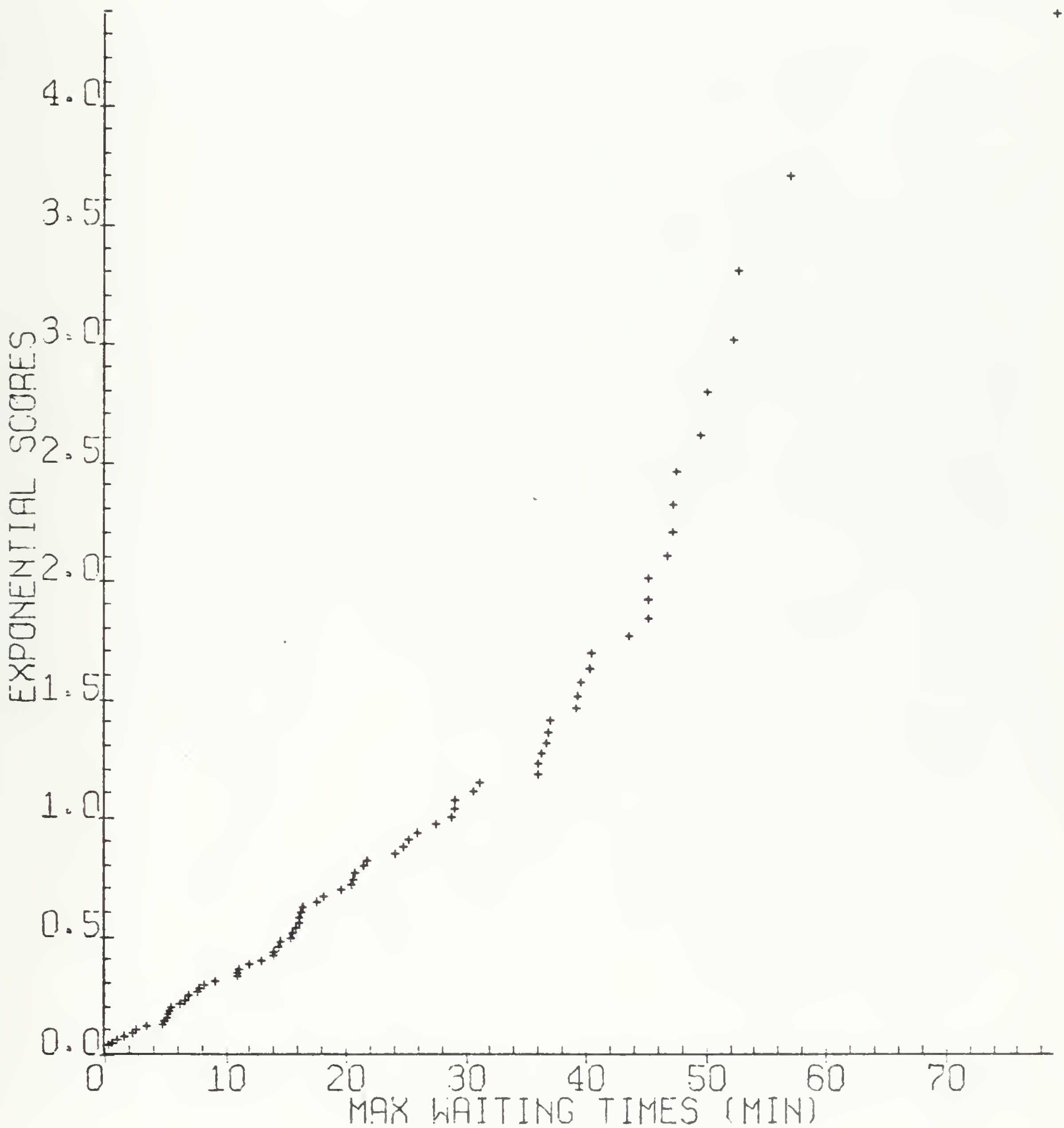
EXPONENTIAL PLOT OF THE
ANTITHETIC DATA FOR THE WAITING
TIMES OF THE FIFTH CUSTOMER
(EXP/EXP QUEUE PARAMETERS)



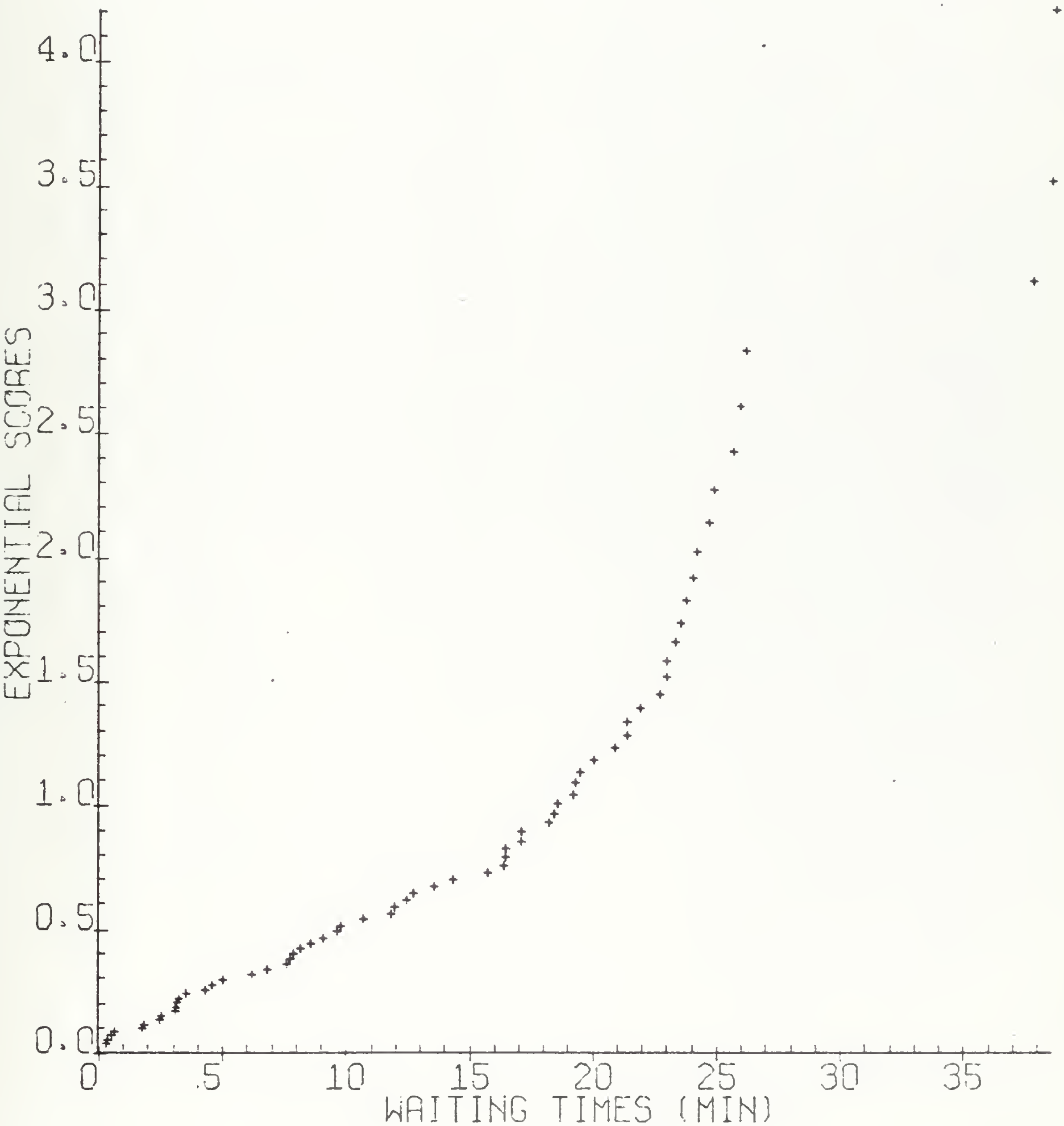
EXPONENTIAL PLOT OF THE ANTITHETIC
DATA FOR THE AVERAGE WAITING TIMES
OF THE FIRST FIVE CUSTOMERS
(EXP/EXP QUEUE PARAMETERS)



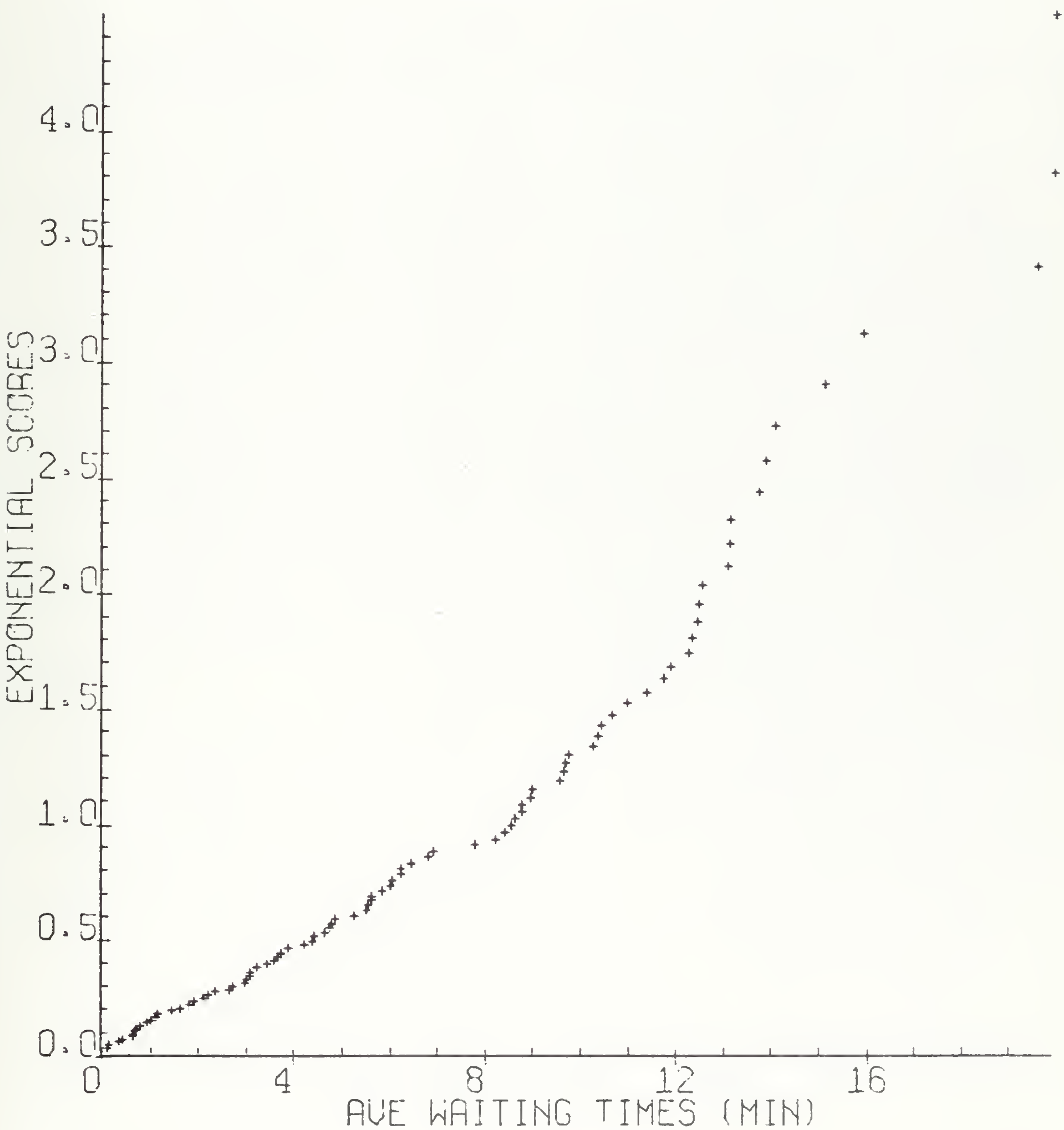
EXPONENTIAL PLOT OF THE ANTITHETIC DATA FOR THE MAXIMUM WAITING TIMES OF THE FIRST FIVE CUSTOMERS (EXP/EXP QUEUE PARAMETERS)



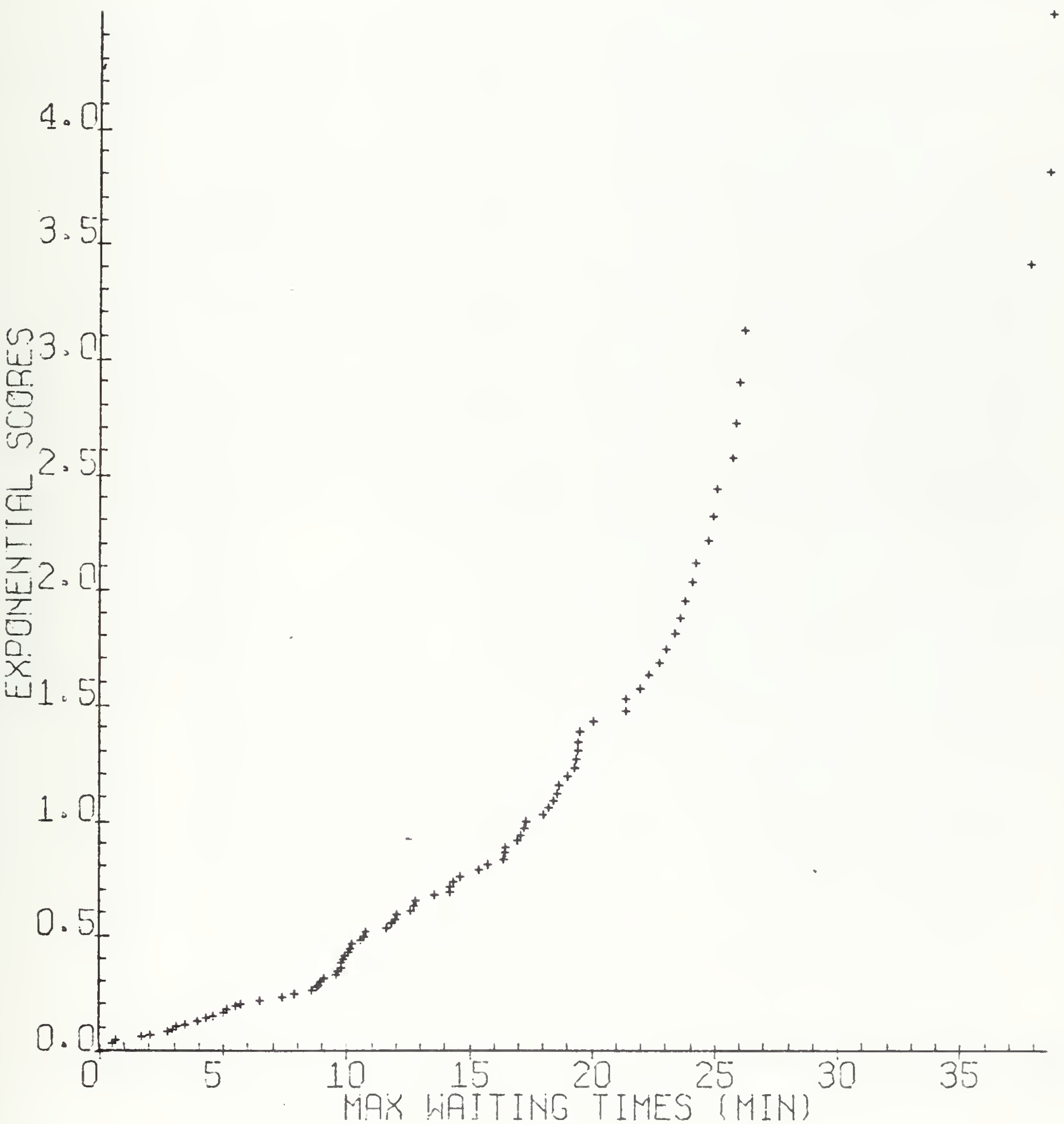
EXPONENTIAL PLOT OF THE STRAIGHT DATA FOR THE WAITING TIMES OF THE FIFTH CUSTOMER (EXP/CONS QUEUE PARAMETERS)



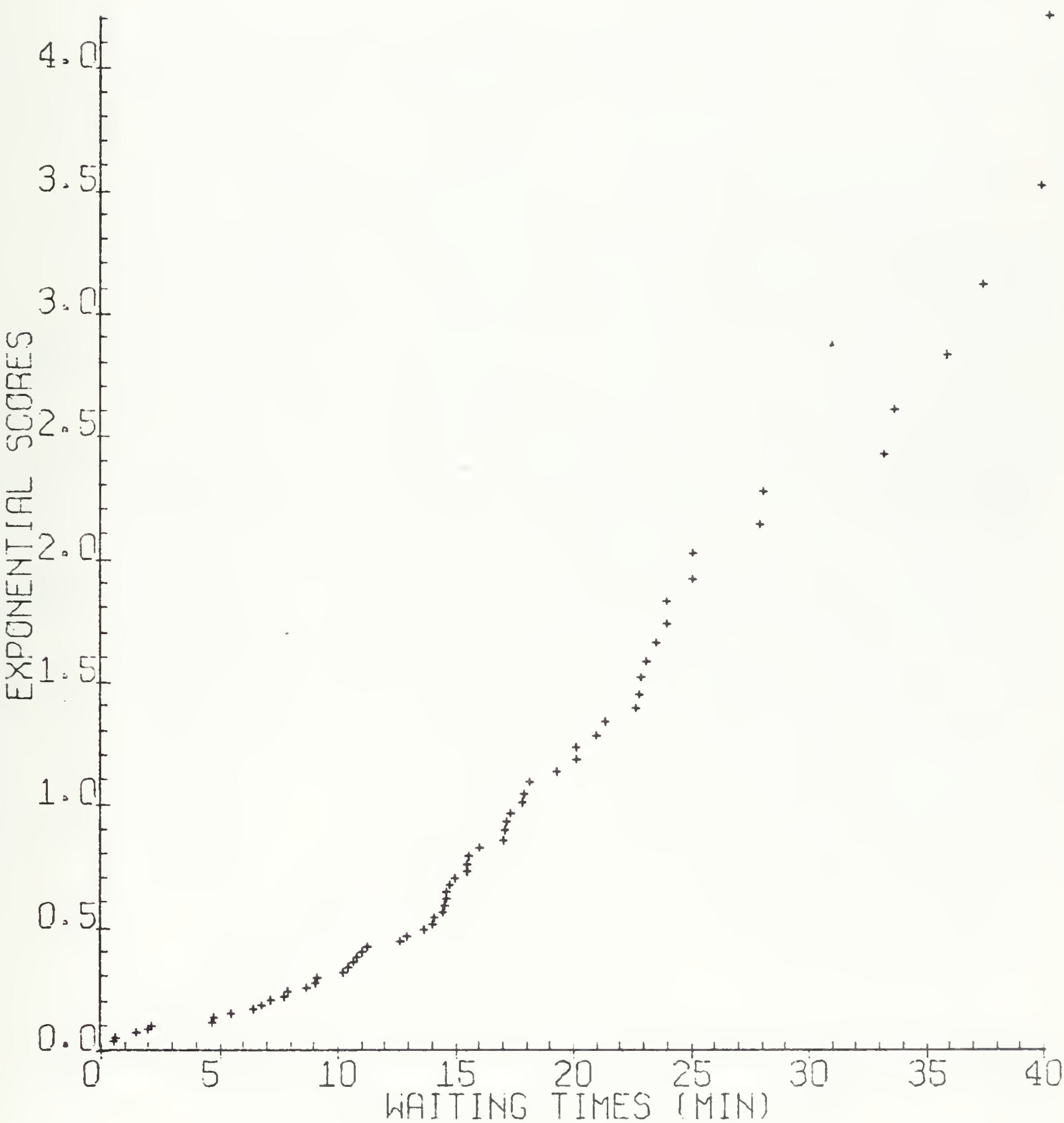
EXPONENTIAL PLOT OF THE STRAIGHT DATA FOR THE AVERAGE WAITING TIMES OF THE FIRST FIVE CUSTOMERS (EXP/CONS QUEUE PARAMETERS)



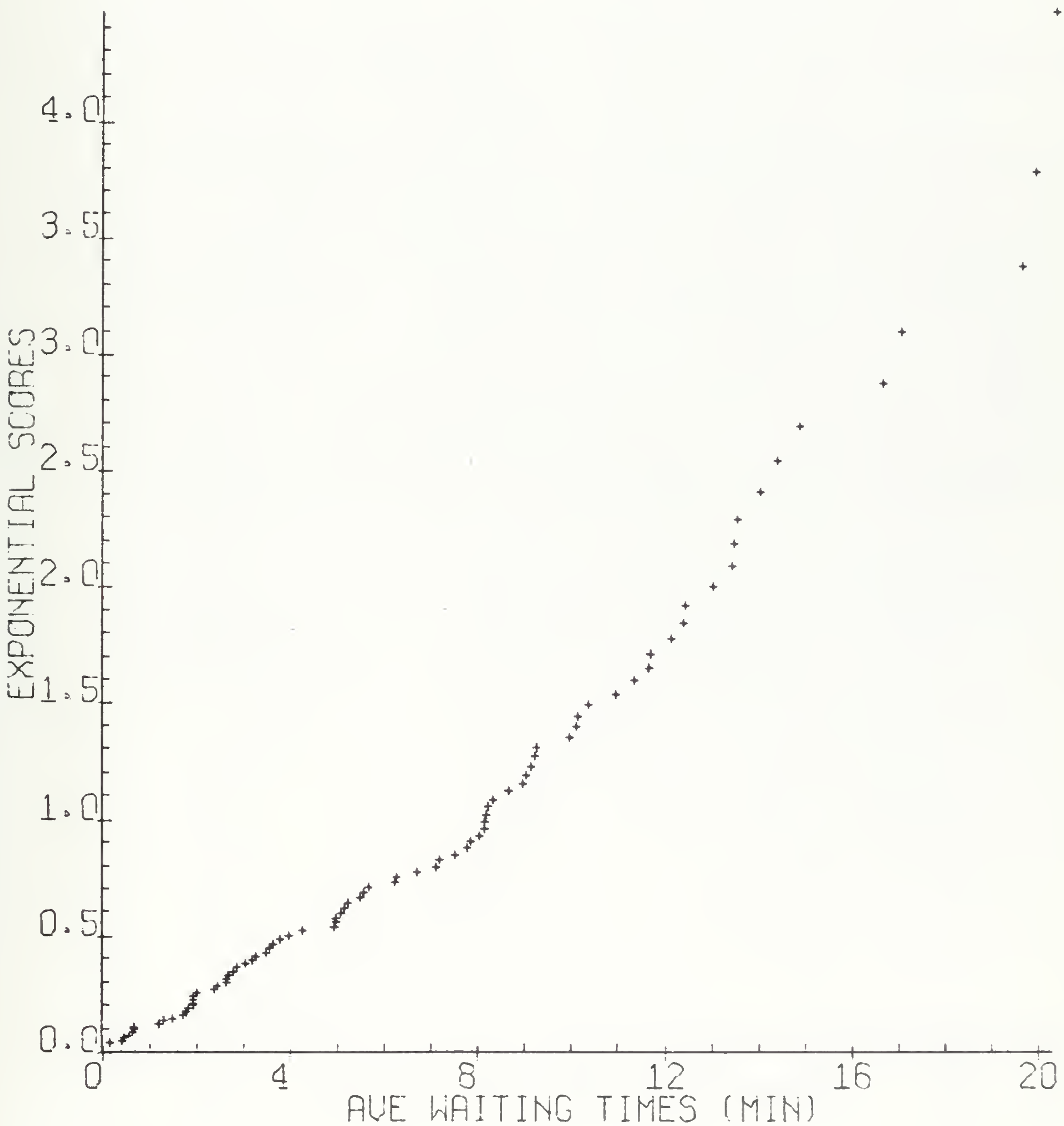
EXPONENTIAL PLOT OF THE STRAIGHT DATA FOR THE MAXIMUM WAITING TIMES OF THE FIRST FIVE CUSTOMERS (EXP/CONS QUEUE PARAMETERS)



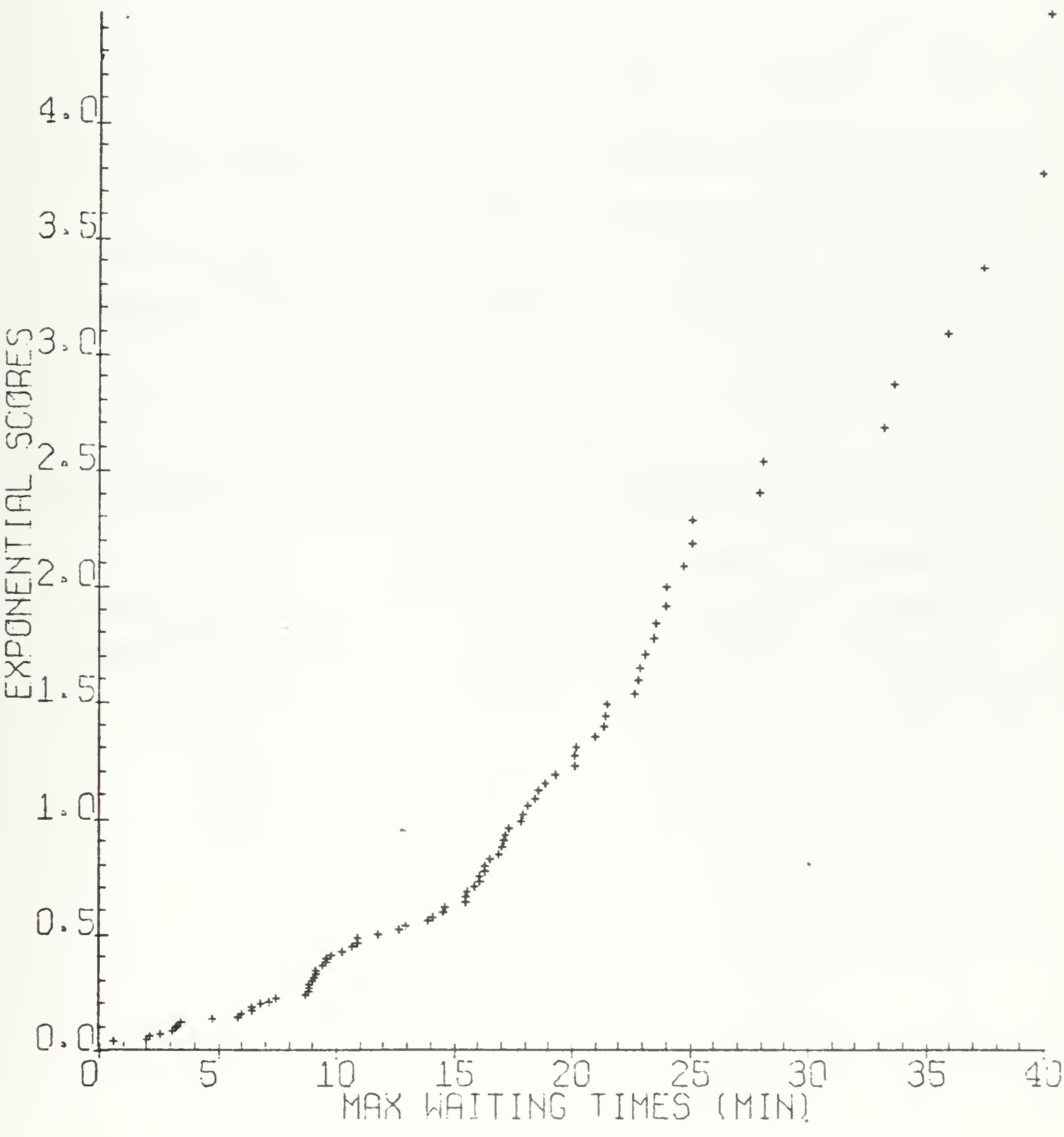
EXPONENTIAL PLOT OF THE
ANTITHETIC DATA FOR THE WAITING
TIMES OF THE FIFTH CUSTOMER
(EXP/CONS QUEUE PARAMETERS)



EXPONENTIAL PLOT OF THE ANTITHETIC DATA FOR THE AVERAGE WAITING TIMES OF THE FIRST FIVE CUSTOMERS (EXP/CONS QUEUE PARAMETERS)



EXPONENTIAL PLOT OF THE ANTITHETIC DATA FOR THE MAXIMUM WAITING TIMES OF THE FIRST FIVE CUSTOMERS (EXP/CONS QUEUE PARAMETERS)



APPENDIX A

STATISTICS FOR THE DISTRIBUTIONS AND QUEUE PROPERTIES

(EXP/EXP QUEUE PARAMETERS)

INTERARRIVAL TIMES

THIS CHARACTERISTIC TIME HAS AN EXPONENTIAL DISTRIBUTION

	STRAIGHT	ANTITHETIC	COMBINED
MEAN OF DIST	9.95	10.28	10.12
VARIANCE OF DIST	104.62	112.38	108.50

SERVICE TIMES

THIS CHARACTERISTIC TIME HAS AN EXPONENTIAL DISTRIBUTION

	STRAIGHT	ANTITHETIC	COMBINED
MEAN OF DIST	11.98	10.06	11.02
VARIANCE OF DIST	116.47	113.65	115.06

Figure 3

STATISTICS FOR THE QUEUE PROPERTIES

THE FOLLOWING STATISTICS ARE FOR THE WAITING TIMES OF THE 5TH CUSTOMER

THE FOLLOWING VALUES ARE BASED ON 2000 STRAIGHT AND 2000 ANTITHETIC REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	13.40	14.91	14.16
VARIANCE :	352.55	405.29	378.92

THE FOLLOWING STATISTICS ARE FOR THE AVERAGE WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 2000 STRAIGHT AND 2000 ANTITHETIC REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	7.80	8.52	8.16
VARIANCE :	97.03	115.25	106.14

THE FOLLOWING STATISTICS ARE FOR THE MAXIMUM WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 2000 STRAIGHT AND 2000 ANTITHETIC REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	17.37	18.59	17.98
VARIANCE :	353.93	400.96	377.44

Figure 1a

STATISTICS FOR THE QUEUE PROPERTIES

THE FOLLOWING STATISTICS ARE FOR THE WAITING TIMES OF THE 5TH CUSTOMER

THE FOLLOWING VALUES ARE BASED ON 1126 STRAIGHT AND 1154 ANTITHETIC NON-ZERO REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	23.80	25.84	24.82
VARIANCE :	378.61	419.99	399.30

THE FOLLOWING STATISTICS ARE FOR THE AVERAGE WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 1530 STRAIGHT AND 1554 ANTITHETIC NON-ZERO REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	10.20	10.97	10.58
VARIANCE :	102.40	121.51	111.96

THE FOLLOWING STATISTICS ARE FOR THE MAXIMUM WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 1530 STRAIGHT AND 1554 ANTITHETIC NON-ZERO REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	22.70	23.93	23.32
VARIANCE :	341.53	388.29	364.91

Figure 1b

STATISTICS FOR THE DISTRIBUTIONS AND

QUEUE PROPERTIES

(EXP/CONS QUEUE PARAMETERS)

INTERARRIVAL TIMES

THIS CHARACTERISTIC TIME HAS AN EXPONENTIAL DISTRIBUTION

	STRAIGHT	ANTITHETIC	COMBINED
MEAN OF DIST	9.95	10.28	10.12
VARIANCE OF DIST	104.62	112.38	108.50

SERVICE TIMES

THIS CHARACTERISTIC TIME HAS A MISCELANEOUS DISTRIBUTION

	STRAIGHT	ANTITHETIC	COMBINED
MEAN OF DIST	11.19	11.19	11.19
VARIANCE OF DIST	0.00	0.00	0.00

Figure 4

STATISTICS FOR THE QUEUE PROPERTIES

THE FOLLOWING STATISTICS ARE FOR THE WAITING TIMES OF THE 5TH CUSTOMER

THE FOLLOWING VALUES ARE BASED ON 2000 STRAIGHT AND 2000 ANTITHETIC REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	10.56	11.05	10.80
VARIANCE :	117.12	124.00	120.56

THE FOLLOWING STATISTICS ARE FOR THE AVERAGE WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 2000 STRAIGHT AND 2000 ANTITHETIC REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	6.18	6.29	6.24
VARIANCE :	27.93	29.36	28.64

THE FOLLOWING STATISTICS ARE FOR THE MAXIMUM WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 2000 STRAIGHT AND 2000 ANTITHETIC REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	13.46	13.79	13.62
VARIANCE :	96.21	102.57	99.39

Figure 2a

STATISTICS FOR THE QUEUE PROPERTIES

THE FOLLOWING STATISTICS ARE FOR THE WAITING TIMES OF THE 5TH CUSTOMER

THE FOLLOWING VALUES ARE BASED ON 1292 STRAIGHT AND 1330 ANTITHETIC NON-ZERO REALIZATIONS .

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	16.35	16.61	16.48
VARIANCE :	86.73	94.00	90.36

THE FOLLOWING STATISTICS ARE FOR THE AVERAGE WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 1700 STRAIGHT AND 1709 ANTITHETIC NON-ZERO REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	7.27	7.37	7.32
VARIANCE :	24.94	26.46	25.70

THE FOLLOWING STATISTICS ARE FOR THE MAXIMUM WAITING TIMES OF THE FIRST 5 CUSTOMERS

THE FOLLOWING VALUES ARE BASED ON 1700 STRAIGHT AND 1709 ANTITHETIC NON-ZERO REALIZATIONS

	STRAIGHT	ANTITHETIC	COMBINED
EXPECTED VALUE:	15.84	16.13	15.98
VARIANCE :	75.57	82.14	78.85

Figure 2b

APPENDIX B

RESULTS FOR THE COVERAGE OF σ_P USING THE JACKKNIFE METHOD

The results for a single modification and each of the three transformations are tabulated on each page of this appendix. The first line of each page gives the following information:

1. the queue property data that was used;
2. the queue parameters that were used;
3. the type of modification that was used, and
4. the type of data that was used (straight data or a combination of straight and antithetic data.)

For example, the first line on the following page has the following information:

Waiting times   Exp/Exp   Orig   Stra.

This information means that waiting time data was used from the exp/exp case and that the modification ORIG was used with only straight data. (Note: If a combination of straight and antithetic data were used, stra/anti would have been used in place of stra.)

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	46.5	13.5
75.0	61.0	14.0
80.0	64.0	16.0
85.0	69.5	15.5
90.0	73.0	17.0
95.0	80.0	15.0
98.0	85.0	13.0
99.0	88.5	10.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	53.5	6.5
75.0	66.5	8.5
80.0	70.5	9.5
85.0	74.0	11.0
90.0	78.0	12.0
95.0	83.5	11.5
98.0	90.0	8.0
99.0	91.5	7.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	54.5	5.5
75.0	70.5	4.5
80.0	73.0	7.0
85.0	75.5	9.5
90.0	81.5	8.5
95.0	85.5	9.5
98.0	91.5	6.5
99.0	93.0	6.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	53.0	7.0
75.0	70.5	4.5
80.0	75.5	4.5
85.0	79.5	5.5
90.0	84.0	6.0
95.0	88.0	7.0
98.0	91.0	7.0
99.0	92.0	7.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	57.5	2.5
75.0	74.5	0.5
80.0	78.5	1.5
85.0	84.5	0.5
90.0	86.0	4.0
95.0	89.5	5.5
98.0	93.0	5.0
99.0	96.0	3.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	60.0	0.0
75.0	75.5	-0.5
80.0	78.5	1.5
85.0	85.0	0.0
90.0	88.5	1.5
95.0	91.5	3.5
98.0	94.5	3.5
99.0	96.5	2.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	57.0	3.0
75.0	67.5	7.5
80.0	71.0	9.0
85.0	77.0	8.0
90.0	81.0	9.0
95.0	85.0	10.0
98.0	90.0	8.0
99.0	93.0	6.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	62.0	-2.0
75.0	73.5	1.5
80.0	75.5	4.5
85.0	80.5	4.5
90.0	85.5	4.5
95.0	90.5	4.5
98.0	93.0	5.0
99.0	94.5	4.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	64.0	-4.0
75.0	74.5	0.5
80.0	78.0	2.0
85.0	82.0	3.0
90.0	86.0	4.0
95.0	93.0	2.0
98.0	94.0	4.0
99.0	95.5	3.5

WAITING TIMES EXP/EXP REDF STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	54.0	6.0
75.0	70.5	4.5
80.0	75.5	4.5
85.0	80.0	5.0
90.0	84.0	6.0
95.0	88.0	7.0
98.0	91.0	7.0
99.0	92.5	6.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	75.0	0.0
80.0	79.0	1.0
85.0	84.5	0.5
90.0	86.0	4.0
95.0	89.5	5.5
98.0	93.0	5.0
99.0	96.0	3.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	60.0	0.0
75.0	75.5	-0.5
80.0	79.0	1.0
85.0	85.5	-0.5
90.0	89.0	1.0
95.0	91.5	3.5
98.0	94.5	3.5
99.0	96.5	2.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	46.5	13.5
75.0	57.0	18.0
80.0	61.5	18.5
85.0	66.5	18.5
90.0	69.5	20.5
95.0	76.5	18.5
98.0	80.5	17.5
99.0	82.0	17.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	55.0	5.0
75.0	64.0	11.0
80.0	67.0	13.0
85.0	74.0	11.0
90.0	76.0	14.0
95.0	82.5	12.5
98.0	87.0	11.0
99.0	89.5	9.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	55.0	5.0
75.0	68.5	6.5
80.0	71.0	9.0
85.0	75.0	10.0
90.0	78.5	11.5
95.0	84.5	10.5
98.0	90.0	8.0
99.0	92.0	7.0

WAITING TIMES EXP/EXP SCAN STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	54.5	5.5
75.0	68.5	6.5
80.0	71.5	8.5
85.0	74.5	10.5
90.0	78.0	12.0
95.0	84.5	10.5
98.0	88.5	9.5
99.0	91.5	7.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	57.5	2.5
75.0	76.5	-1.5
80.0	78.5	1.5
85.0	82.0	3.0
90.0	84.0	6.0
95.0	88.5	6.5
98.0	91.0	7.0
99.0	93.0	6.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	60.0	0.0
75.0	78.5	-3.5
80.0	81.0	-1.0
85.0	84.0	1.0
90.0	85.5	4.5
95.0	91.0	4.0
98.0	92.5	5.5
99.0	95.0	4.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	49.2	10.8
75.0	65.6	9.4
80.0	67.7	12.3
85.0	72.3	12.7
90.0	75.4	14.6
95.0	80.5	14.5
98.0	85.1	12.9
99.0	90.3	8.7

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	53.3	6.7
75.0	71.3	3.7
80.0	73.3	6.7
85.0	77.9	7.1
90.0	80.5	9.5
95.0	86.2	8.8
98.0	91.8	6.2
99.0	92.3	6.7

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	54.9	5.1
75.0	70.3	4.7
80.0	77.4	2.6
85.0	79.0	6.0
90.0	83.6	6.4
95.0	89.2	5.8
98.0	92.3	5.7
99.0	95.4	3.6

AVE WAITING TIMES   EXP/EXP   ORIG   STRA   19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	42.0	18.0
75.0	53.5	21.5
80.0	59.0	21.0
85.0	64.5	20.5
90.0	68.0	22.0
95.0	74.0	21.0
98.0	79.0	19.0
99.0	82.5	16.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	47.5	12.5
75.0	58.5	16.5
80.0	62.5	17.5
85.0	71.0	14.0
90.0	74.0	16.0
95.0	82.5	12.5
98.0	86.0	12.0
99.0	88.0	11.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	49.5	10.5
75.0	62.0	13.0
80.0	66.5	13.5
85.0	73.5	11.5
90.0	78.5	11.5
95.0	84.0	11.0
98.0	88.5	9.5
99.0	91.5	7.5

AVE WAITING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	52.0	8.0
75.0	69.5	5.5
80.0	73.5	6.5
85.0	79.5	5.5
90.0	84.0	6.0
95.0	87.0	8.0
98.0	89.0	9.0
99.0	91.0	8.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	55.5	4.5
75.0	73.5	1.5
80.0	77.5	2.5
85.0	82.5	2.5
90.0	84.0	6.0
95.0	89.5	5.5
98.0	94.5	3.5
99.0	95.5	3.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	57.5	2.5
75.0	74.0	1.0
80.0	80.0	0.0
85.0	84.0	1.0
90.0	87.0	3.0
95.0	92.0	3.0
98.0	94.5	3.5
99.0	95.5	3.5

AVE WAITING TIMES EXP/EXP REDF STRA 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	43.5	16.5
75.0	58.0	17.0
80.0	63.0	17.0
85.0	67.0	18.0
90.0	71.0	19.0
95.0	77.0	18.0
98.0	83.5	14.5
99.0	86.5	12.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	49.0	11.0
75.0	61.5	13.5
80.0	68.0	12.0
85.0	75.0	10.0
90.0	77.5	12.5
95.0	83.5	11.5
98.0	87.5	10.5
99.0	90.0	9.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	51.5	8.5
75.0	66.5	8.5
80.0	72.0	8.0
85.0	76.0	9.0
90.0	81.0	9.0
95.0	86.0	9.0
98.0	90.0	8.0
99.0	93.0	6.0

AVE WAITING TIMES   EXP/EXP   REDF   STRA/ANTI   19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	52.0	8.0
75.0	69.5	5.5
80.0	73.5	6.5
85.0	79.5	5.5
90.0	84.0	6.0
95.0	87.0	8.0
98.0	89.0	9.0
99.0	91.0	8.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	55.5	4.5
75.0	73.5	1.5
80.0	77.5	2.5
85.0	82.5	2.5
90.0	84.0	6.0
95.0	89.5	5.5
98.0	94.5	3.5
99.0	95.5	3.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	57.5	2.5
75.0	74.0	1.0
80.0	80.0	0.0
85.0	84.0	1.0
90.0	87.0	3.0
95.0	92.0	3.0
98.0	94.5	3.5
99.0	95.5	3.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	40.5	19.5
75.0	53.0	22.0
80.0	58.0	22.0
85.0	63.5	21.5
90.0	66.5	23.5
95.0	72.5	22.5
98.0	78.0	20.0
99.0	82.5	16.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	45.5	14.5
75.0	57.0	18.0
80.0	62.5	17.5
85.0	70.0	15.0
90.0	73.0	17.0
95.0	82.5	12.5
98.0	86.0	12.0
99.0	87.5	11.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	48.5	11.5
75.0	60.5	14.5
80.0	66.0	14.0
85.0	73.0	12.0
90.0	78.0	12.0
95.0	83.5	11.5
98.0	87.5	10.5
99.0	90.0	9.0

AVE WAITING TIMES EXP/EXP SCAN STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	53.0	7.0
75.0	65.5	9.5
80.0	71.0	9.0
85.0	78.5	6.5
90.0	83.0	7.0
95.0	86.0	9.0
98.0	89.0	9.0
99.0	91.0	8.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	54.0	6.0
75.0	71.5	3.5
80.0	78.5	1.5
85.0	81.0	4.0
90.0	83.5	6.5
95.0	88.5	6.5
98.0	94.0	4.0
99.0	95.0	4.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	56.0	4.0
75.0	72.5	2.5
80.0	80.0	0.0
85.0	84.0	1.0
90.0	86.0	4.0
95.0	90.5	4.5
98.0	94.5	3.5
99.0	95.5	3.5

. STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	41.5	18.5
75.0	53.5	21.5
80.0	59.0	21.0
85.0	61.5	23.5
90.0	68.5	21.5
95.0	77.0	18.0
98.0	84.0	14.0
99.0	86.0	13.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	47.0	13.0
75.0	56.0	19.0
80.0	63.0	17.0
85.0	70.5	14.5
90.0	77.0	13.0
95.0	84.5	10.5
98.0	88.5	9.5
99.0	93.5	5.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	49.0	11.0
75.0	62.0	13.0
80.0	66.5	13.5
85.0	74.5	10.5
90.0	81.0	9.0
95.0	85.5	9.5
98.0	93.0	5.0
99.0	94.5	4.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	46.0	14.0
75.0	58.5	16.5
80.0	61.0	19.0
85.0	64.5	20.5
90.0	71.0	19.0
95.0	81.0	14.0
98.0	86.5	11.5
99.0	89.0	10.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	46.5	13.5
75.0	60.5	14.5
80.0	65.5	14.5
85.0	72.5	12.5
90.0	78.5	11.5
95.0	87.5	7.5
98.0	91.5	6.5
99.0	95.0	4.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	47.5	12.5
75.0	64.5	10.5
80.0	70.5	9.5
85.0	76.5	8.5
90.0	82.0	8.0
95.0	89.0	6.0
98.0	94.5	3.5
99.0	95.5	3.5

MAX WAITING TIMES   EXP/EXP   ORIG   STRA/ANTI   19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	71.0	4.0
80.0	75.5	4.5
85.0	80.5	4.5
90.0	82.5	7.5
95.0	87.5	7.5
98.0	91.5	6.5
99.0	92.5	6.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	73.5	1.5
80.0	77.0	3.0
85.0	82.0	3.0
90.0	85.0	5.0
95.0	91.5	3.5
98.0	92.5	5.5
99.0	95.0	4.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	76.0	-1.0
80.0	80.0	0.0
85.0	84.5	0.5
90.0	88.0	2.0
95.0	92.5	2.5
98.0	94.0	4.0
99.0	96.5	2.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	49.0	11.0
75.0	62.5	12.5
80.0	65.0	15.0
85.0	67.0	18.0
90.0	74.5	15.5
95.0	84.5	10.5
98.0	90.0	8.0
99.0	91.5	7.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	51.0	9.0
75.0	64.0	11.0
80.0	69.0	11.0
85.0	76.0	9.0
90.0	82.5	7.5
95.0	90.5	4.5
98.0	93.5	4.5
99.0	95.0	4.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	50.5	9.5
75.0	66.5	8.5
80.0	73.0	7.0
85.0	80.5	4.5
90.0	85.5	4.5
95.0	93.0	2.0
98.0	95.5	2.5
99.0	95.5	3.5

MAX WAITING TIMES EXP/EXP REDF STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	71.5	3.5
80.0	75.5	4.5
85.0	80.5	4.5
90.0	82.5	7.5
95.0	87.5	7.5
98.0	91.5	6.5
99.0	92.5	6.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	74.0	1.0
80.0	77.0	3.0
85.0	82.0	3.0
90.0	85.0	5.0
95.0	91.5	3.5
98.0	92.5	5.5
99.0	95.0	4.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	76.0	-1.0
80.0	80.5	-0.5
85.0	84.5	0.5
90.0	88.0	2.0
95.0	92.5	2.5
98.0	94.0	4.0
99.0	96.5	2.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	41.5	18.5
75.0	58.0	17.0
80.0	58.5	21.5
85.0	63.0	22.0
90.0	68.5	21.5
95.0	76.5	18.5
98.0	82.0	16.0
99.0	86.5	12.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	45.5	14.5
75.0	59.0	16.0
80.0	62.5	17.5
85.0	69.5	15.5
90.0	76.0	14.0
95.0	82.5	12.5
98.0	90.0	8.0
99.0	93.0	6.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	48.0	12.0
75.0	62.0	13.0
80.0	67.5	12.5
85.0	74.0	11.0
90.0	79.0	11.0
95.0	87.0	8.0
98.0	93.0	5.0
99.0	94.5	4.5

MAX WAITING TIMES EXP/EXP SCAN STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	57.0	3.0
75.0	69.5	5.5
80.0	72.0	8.0
85.0	77.0	8.0
90.0	79.0	11.0
95.0	84.5	10.5
98.0	89.5	8.5
99.0	92.0	7.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	56.0	4.0
75.0	73.0	2.0
80.0	76.0	4.0
85.0	80.5	4.5
90.0	84.0	6.0
95.0	88.5	6.5
98.0	92.0	6.0
99.0	93.0	6.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	58.0	2.0
75.0	75.0	0.0
80.0	78.0	2.0
85.0	84.0	1.0
90.0	86.0	4.0
95.0	90.0	5.0
98.0	92.5	5.5
99.0	96.0	3.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	43.0	17.0
75.0	55.5	19.5
80.0	61.0	19.0
85.0	64.0	21.0
90.0	70.0	20.0
95.0	78.5	16.5
98.0	86.5	11.5
99.0	89.5	9.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	49.0	11.0
75.0	62.0	13.0
80.0	66.5	13.5
85.0	73.5	11.5
90.0	77.0	13.0
95.0	87.5	7.5
98.0	93.0	5.0
99.0	96.0	3.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	52.0	8.0
75.0	66.0	9.0
80.0	70.5	9.5
85.0	76.0	9.0
90.0	81.5	8.5
95.0	90.5	4.5
98.0	96.0	2.0
99.0	97.5	1.5

WAITING TIMES EXP/CONS ORIG STRA 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	66.0	-6.0
75.0	80.0	-5.0
80.0	83.0	-3.0
85.0	86.0	-1.0
90.0	88.5	1.5
95.0	93.0	2.0
98.0	95.0	3.0
99.0	97.0	2.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.5	-8.5
75.0	80.5	-5.5
80.0	87.5	-7.5
85.0	88.5	-3.5
90.0	90.0	0.0
95.0	94.5	0.5
98.0	96.5	1.5
99.0	98.0	1.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.0	-10.0
75.0	82.0	-7.0
80.0	87.0	-7.0
85.0	90.0	-5.0
90.0	90.5	-0.5
95.0	94.0	1.0
98.0	98.5	-0.5
99.0	99.0	0.0

WAITING TIMES EXP/CONS ORIG STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.5	-8.5
75.0	79.5	-4.5
80.0	83.5	-3.5
85.0	89.5	-4.5
90.0	91.5	-1.5
95.0	95.0	0.0
98.0	96.5	1.5
99.0	97.0	2.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.5	-10.5
75.0	83.0	-8.0
80.0	84.5	-4.5
85.0	88.5	-3.5
90.0	93.5	-3.5
95.0	95.5	-0.5
98.0	96.5	1.5
99.0	97.5	1.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.5	-10.5
75.0	83.5	-8.5
80.0	84.5	-4.5
85.0	89.0	-4.0
90.0	93.5	-3.5
95.0	96.5	-1.5
98.0	97.0	1.0
99.0	98.5	0.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	74.0	-14.0
75.0	84.5	-9.5
80.0	86.5	-6.5
85.0	90.0	-5.0
90.0	93.5	-3.5
95.0	94.0	1.0
98.0	98.0	0.0
99.0	98.5	0.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	77.0	-17.0
75.0	88.0	-13.0
80.0	89.5	-9.5
85.0	90.5	-5.5
90.0	92.5	-2.5
95.0	98.0	-3.0
98.0	99.5	-1.5
99.0	99.5	-0.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	76.0	-16.0
75.0	88.0	-13.0
80.0	90.0	-10.0
85.0	91.0	-6.0
90.0	94.0	-4.0
95.0	98.0	-3.0
98.0	99.5	-1.5
99.0	****	-1.0

. STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.5	-8.5
75.0	80.0	-5.0
80.0	83.5	-3.5
85.0	89.5	-4.5
90.0	91.5	-1.5
95.0	95.5	-0.5
98.0	96.5	1.5
99.0	97.0	2.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.5	-10.5
75.0	83.5	-8.5
80.0	84.5	-4.5
85.0	88.5	-3.5
90.0	93.5	-3.5
95.0	95.5	-0.5
98.0	96.5	1.5
99.0	97.5	1.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.5	-10.5
75.0	83.5	-8.5
80.0	84.5	-4.5
85.0	89.0	-4.0
90.0	93.5	-3.5
95.0	96.5	-1.5
98.0	97.0	1.0
99.0	98.5	0.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	61.0	-1.0
75.0	69.0	6.0
80.0	73.5	6.5
85.0	77.0	8.0
90.0	83.0	7.0
95.0	87.0	8.0
98.0	92.0	6.0
99.0	94.0	5.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	64.5	-4.5
75.0	74.0	1.0
80.0	79.5	0.5
85.0	85.0	0.0
90.0	86.5	3.5
95.0	90.0	5.0
98.0	94.0	4.0
99.0	96.5	2.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	64.5	-4.5
75.0	77.5	-2.5
80.0	82.0	-2.0
85.0	86.5	-1.5
90.0	87.5	2.5
95.0	92.5	2.5
98.0	97.0	1.0
99.0	98.5	0.5

WAITING TIMES EXP/CONS SCAN STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	60.5	-0.5
75.0	73.5	1.5
80.0	79.0	1.0
85.0	85.5	-0.5
90.0	88.0	2.0
95.0	91.5	3.5
98.0	94.0	4.0
99.0	95.5	3.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	65.5	-5.5
75.0	77.0	-2.0
80.0	83.5	-3.5
85.0	89.0	-4.0
90.0	90.5	-0.5
95.0	93.5	1.5
98.0	95.5	2.5
99.0	96.0	3.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.5	-8.5
75.0	79.5	-4.5
80.0	85.0	-5.0
85.0	91.0	-6.0
90.0	92.5	-2.5
95.0	94.5	0.5
98.0	96.0	2.0
99.0	97.0	2.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	59.1	0.9
75.0	68.2	6.8
80.0	68.7	11.3
85.0	74.2	10.8
90.0	80.8	9.2
95.0	85.4	9.6
98.0	93.4	4.6
99.0	94.4	4.6

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	64.6	-4.6
75.0	74.7	0.3
80.0	78.8	1.2
85.0	84.3	0.7
90.0	85.9	4.1
95.0	92.9	2.1
98.0	96.0	2.0
99.0	97.5	1.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.7	-8.7
75.0	80.3	-5.3
80.0	84.3	-4.3
85.0	86.4	-1.4
90.0	90.4	-0.4
95.0	95.5	-0.5
98.0	97.0	1.0
99.0	98.5	0.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.0	-9.0
75.0	82.0	-7.0
80.0	84.0	-4.0
85.0	90.0	-5.0
90.0	90.5	-0.5
95.0	93.0	2.0
98.0	94.0	4.0
99.0	96.0	3.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	72.5	-12.5
75.0	82.0	-7.0
80.0	85.5	-5.5
85.0	89.0	-4.0
90.0	92.0	-2.0
95.0	93.5	1.5
98.0	96.0	2.0
99.0	96.5	2.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	73.0	-13.0
75.0	82.0	-7.0
80.0	84.5	-4.5
85.0	88.5	-3.5
90.0	92.0	-2.0
95.0	94.0	1.0
98.0	96.0	2.0
99.0	97.5	1.5

AVE WAITING TIMES   EXP/CONS   ORIG   STRA/ANTI   19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.0	-9.0
75.0	85.0	-10.0
80.0	87.0	-7.0
85.0	90.5	-5.5
90.0	92.5	-2.5
95.0	96.0	-1.0
98.0	97.5	0.5
99.0	98.5	0.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.0	-9.0
75.0	82.5	-7.5
80.0	88.0	-8.0
85.0	92.5	-7.5
90.0	94.0	-4.0
95.0	96.0	-1.0
98.0	99.0	-1.0
99.0	99.0	0.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.5	-9.5
75.0	82.5	-7.5
80.0	88.0	-8.0
85.0	93.0	-8.0
90.0	95.5	-5.5
95.0	97.0	-2.0
98.0	99.0	-1.0
99.0	99.0	0.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	72.0	-12.0
75.0	83.0	-8.0
80.0	85.5	-5.5
85.0	91.0	-6.0
90.0	91.0	-1.0
95.0	94.0	1.0
98.0	94.5	3.5
99.0	96.0	3.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	73.5	-13.5
75.0	83.0	-8.0
80.0	86.0	-6.0
85.0	90.5	-5.5
90.0	93.5	-3.5
95.0	94.0	1.0
98.0	96.5	1.5
99.0	96.5	2.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	74.5	-14.5
75.0	83.0	-8.0
80.0	86.0	-6.0
85.0	89.0	-4.0
90.0	93.5	-3.5
95.0	94.5	0.5
98.0	96.5	1.5
99.0	98.5	0.5

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.0	-9.0
75.0	85.0	-10.0
80.0	87.0	-7.0
85.0	90.5	-5.5
90.0	92.5	-2.5
95.0	96.0	-1.0
98.0	97.5	0.5
99.0	98.5	0.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.0	-9.0
75.0	82.5	-7.5
80.0	88.0	-8.0
85.0	92.5	-7.5
90.0	94.0	-4.0
95.0	96.0	-1.0
98.0	99.0	-1.0
99.0	99.0	0.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.5	-9.5
75.0	82.5	-7.5
80.0	88.0	-8.0
85.0	93.0	-8.0
90.0	95.5	-5.5
95.0	97.0	-2.0
98.0	99.0	-1.0
99.0	99.0	0.0

AVE WAITING TIMES EXP/CONS SCAN STRA 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE		
T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.5	-8.5
75.0	81.5	-6.5
80.0	84.0	-4.0
85.0	89.5	-4.5
90.0	90.0	0.0
95.0	91.5	3.5
98.0	93.0	5.0
99.0	94.5	4.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE		
T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	73.0	-13.0
75.0	82.0	-7.0
80.0	86.5	-6.5
85.0	90.0	-5.0
90.0	91.0	-1.0
95.0	92.5	2.5
98.0	95.0	3.0
99.0	96.5	2.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE		
T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	73.0	-13.0
75.0	83.0	-8.0
80.0	85.5	-5.5
85.0	89.0	-4.0
90.0	91.5	-1.5
95.0	93.5	1.5
98.0	95.5	2.5
99.0	97.0	2.0

AVE WAITING TIMES EXP/CONS SCAN STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.0	-8.0
75.0	83.5	-8.5
80.0	85.0	-5.0
85.0	89.0	-4.0
90.0	91.5	-1.5
95.0	94.5	0.5
98.0	97.0	1.0
99.0	98.5	0.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.0	-10.0
75.0	83.5	-8.5
80.0	87.0	-7.0
85.0	91.0	-6.0
90.0	93.5	-3.5
95.0	96.5	-1.5
98.0	99.0	-1.0
99.0	99.0	0.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.0	-10.0
75.0	84.5	-9.5
80.0	89.0	-9.0
85.0	91.5	-6.5
90.0	94.0	-4.0
95.0	97.0	-2.0
98.0	99.0	-1.0
99.0	99.0	0.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	66.0	-6.0
75.0	79.5	-4.5
80.0	81.5	-1.5
85.0	86.0	-1.0
90.0	89.0	1.0
95.0	91.0	4.0
98.0	92.5	5.5
99.0	95.0	4.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	69.0	-9.0
75.0	83.0	-8.0
80.0	85.0	-5.0
85.0	89.0	-4.0
90.0	91.0	-1.0
95.0	92.0	3.0
98.0	95.0	3.0
99.0	95.5	3.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	71.5	-11.5
75.0	83.0	-8.0
80.0	86.5	-6.5
85.0	90.0	-5.0
90.0	91.5	-1.5
95.0	93.5	1.5
98.0	95.5	2.5
99.0	97.0	2.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	68.0	-8.0
75.0	82.5	-7.5
80.0	85.5	-5.5
85.0	89.0	-4.0
90.0	90.5	-0.5
95.0	93.0	2.0
98.0	97.5	0.5
99.0	97.5	1.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.0	-10.0
75.0	83.0	-8.0
80.0	86.5	-6.5
85.0	90.0	-5.0
90.0	91.5	-1.5
95.0	96.5	-1.5
98.0	97.5	0.5
99.0	97.5	1.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	72.0	-12.0
75.0	83.5	-8.5
80.0	87.5	-7.5
85.0	90.5	-5.5
90.0	93.5	-3.5
95.0	97.0	-2.0
98.0	97.5	0.5
99.0	98.0	1.0

MAX WAITING TIMES   EXP/CONS   ORIG   STRA/ANTI   19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.0	-10.0
75.0	84.0	-9.0
80.0	87.5	-7.5
85.0	89.0	-4.0
90.0	94.0	-4.0
95.0	95.5	-0.5
98.0	96.0	2.0
99.0	99.0	0.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	73.5	-13.5
75.0	84.0	-9.0
80.0	88.0	-8.0
85.0	91.5	-6.5
90.0	94.0	-4.0
95.0	96.0	-1.0
98.0	99.0	-1.0
99.0	99.5	-0.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	74.5	-14.5
75.0	84.5	-9.5
80.0	88.0	-8.0
85.0	92.0	-7.0
90.0	93.5	-3.5
95.0	97.5	-2.5
98.0	99.0	-1.0
99.0	****	-1.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.5	-10.5
75.0	83.0	-8.0
80.0	87.0	-7.0
85.0	89.5	-4.5
90.0	92.5	-2.5
95.0	93.5	1.5
98.0	97.5	0.5
99.0	97.5	1.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	72.0	-12.0
75.0	85.5	-10.5
80.0	88.0	-8.0
85.0	91.0	-6.0
90.0	93.0	-3.0
95.0	97.0	-2.0
98.0	97.5	0.5
99.0	97.5	1.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	74.0	-14.0
75.0	86.5	-11.5
80.0	89.0	-9.0
85.0	91.0	-6.0
90.0	94.0	-4.0
95.0	97.5	-2.5
98.0	97.5	0.5
99.0	98.0	1.0

MAX WAITING TIMES EXP/CONS REDF STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.0	-10.0
75.0	84.0	-9.0
80.0	87.5	-7.5
85.0	89.0	-4.0
90.0	94.0	-4.0
95.0	95.5	-0.5
98.0	96.0	2.0
99.0	99.0	0.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	73.5	-13.5
75.0	84.0	-9.0
80.0	88.0	-8.0
85.0	91.5	-6.5
90.0	94.0	-4.0
95.0	96.0	-1.0
98.0	99.0	-1.0
99.0	99.5	-0.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	74.5	-14.5
75.0	84.5	-9.5
80.0	88.0	-8.0
85.0	92.0	-7.0
90.0	93.5	-3.5
95.0	97.5	-2.5
98.0	99.0	-1.0
99.0	****	-1.0

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	62.0	-2.0
75.0	74.0	1.0
80.0	78.5	1.5
85.0	81.5	3.5
90.0	86.0	4.0
95.0	89.5	5.5
98.0	96.0	2.0
99.0	96.0	3.0

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	64.5	-4.5
75.0	79.0	-4.0
80.0	82.0	-2.0
85.0	87.0	-2.0
90.0	89.0	1.0
95.0	95.5	-0.5
98.0	96.0	2.0
99.0	96.5	2.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	65.5	-5.5
75.0	81.5	-6.5
80.0	85.5	-5.5
85.0	88.5	-3.5
90.0	92.0	-2.0
95.0	96.0	-1.0
98.0	96.5	1.5
99.0	97.5	1.5

MAX WAITING TIMES EXP/CONS SCAN STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE		
T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	65.0	-5.0
75.0	79.5	-4.5
80.0	82.5	-2.5
85.0	86.5	-1.5
90.0	93.0	-3.0
95.0	94.0	1.0
98.0	95.5	2.5
99.0	97.5	1.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE		
T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	70.5	-10.5
75.0	81.0	-6.0
80.0	85.0	-5.0
85.0	91.5	-6.5
90.0	93.5	-3.5
95.0	95.5	-0.5
98.0	98.0	0.0
99.0	99.0	0.0

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE		
T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	72.5	-12.5
75.0	82.5	-7.5
80.0	88.0	-8.0
85.0	92.0	-7.0
90.0	93.0	-3.0
95.0	97.5	-2.5
98.0	99.0	-1.0
99.0	99.5	-0.5

MAX WAITING TIMES EXP/CONS DELZ STRA 19 JUL 72

STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	56.0	4.0
75.0	67.0	8.0
80.0	70.0	10.0
85.0	76.5	8.5
90.0	80.5	9.5
95.0	84.5	10.5
98.0	92.0	6.0
99.0	95.5	3.5

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	59.5	0.5
75.0	73.5	1.5
80.0	77.5	2.5
85.0	82.5	2.5
90.0	86.0	4.0
95.0	93.5	1.5
98.0	95.5	2.5
99.0	96.5	2.5

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

PERCENTAGE OF COVERAGE T-TABLE PRED.	ACTUAL	DIFFERENCE
60.0	62.5	-2.5
75.0	76.0	-1.0
80.0	81.0	-1.0
85.0	86.0	-1.0
90.0	89.5	0.5
95.0	95.5	-0.5
98.0	96.0	2.0
99.0	98.0	1.0

APPENDIX C

RESULTS FOR THE COVERAGE OF σ_P USING THE CHI-SQUARED METHOD

The results for the single modification ORIG and un-transformed data are given on each page of this appendix. The first line on each page gives the following information:

1. the queue property data that was used;
2. the queue parameters that were used;
3. the type of modification that was used, and
4. the type of data that was used (straight data or a combination of straight and antithetic data).

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	57.0	23.0
90.0	71.5	18.5
95.0	78.5	16.5
98.0	86.5	11.5
99.0	88.5	10.5

WAITING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE		
CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	81.5	-1.5
90.0	91.5	-1.5
95.0	95.5	-0.5
98.0	98.0	0.0
99.0	98.0	1.0

AVE WAITING TIMES   EXP/EXP   ORIG   STRA   19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	54.5	25.5
90.0	67.5	22.5
95.0	76.5	18.5
98.0	81.0	17.0
99.0	89.5	9.5

AVE WAITING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE		
CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	75.5	4.5
90.0	87.0	3.0
95.0	93.0	2.0
98.0	98.0	0.0
99.0	98.0	1.0

MAX WAITING TIMES   EXP/EXP   ORIG   STRA   19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	63.0	17.0
90.0	76.0	14.0
95.0	85.5	9.5
98.0	91.5	6.5
99.0	96.0	3.0

MAX WAITING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE		
CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	83.5	-3.5
90.0	92.0	-2.0
95.0	98.0	-3.0
98.0	98.5	-0.5
99.0	99.5	-0.5

MAX WAITING TIMES   EXP/CONS   ORIG   STRA   19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	90.5	-10.5
90.0	97.5	-7.5
95.0	98.5	-3.5
98.0	98.5	-0.5
99.0	99.5	-0.5

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	91.0	-11.0
90.0	97.0	-7.0
95.0	98.5	-3.5
98.0	99.5	-1.5
99.0	99.5	-0.5

WAITING TIMES EXP/CONS ORIG STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	97.5	-17.5
90.0	99.5	-9.5
95.0	99.5	-4.5
98.0	****	-2.0
99.0	****	-1.0

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	91.0	-11.0
90.0	96.5	-6.5
95.0	98.0	-3.0
98.0	99.0	-1.0
99.0	****	-1.0

AVE WAITING TIMES EXP/CONS ORIG STRA/ANTI 19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	96.0	-16.0
90.0	98.5	-8.5
95.0	99.5	-4.5
98.0	****	-2.0
99.0	****	-1.0

MAX WAITING TIMES   EXP/CONS   ORIG   STRA   19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	90.5	-10.5
90.0	97.5	-7.5
95.0	98.5	-3.5
98.0	98.5	-0.5
99.0	99.5	-0.5

MAX WAITING TIMES   EXP/CONS   ORIG   STRA/ANTI   19 JUL 72

STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENTAGES

RESULTS USING UNTRANSFORMED DATA SUBSETS

PERCENTAGE OF COVERAGE		
CHI-TABLE PRED.	ACTUAL	DIFFERENCE
80.0	96.0	-16.0
90.0	98.5	-8.5
95.0	99.5	-4.5
98.0	****	-2.0
99.0	****	-1.0

APPENDIX D

STATISTICS FOR THE CONFIDENCE INTERVALS CALCULATED BY THE JACKKNIFE METHOD

The following statistics were calculated for the confidence intervals at each percentage of coverage:

1. the expected values of the upper and lower limits;
2. the expected value of the confidence interval widths, and
3. the standard deviation of the confidence interval widths.

The first line on each page gives the following information:

1. the queue property data that was used;
2. the queue parameters that were used;
3. the type of modification that was used, and
4. the type of data that was used (straight data or a combination of straight and antithetic data).

WAITING TIMES EXP/EXP ORIG STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	13.59	23.86	10.27	7.01
75	11.57	25.88	14.31	9.76
80	10.68	26.77	16.09	10.97
85	9.37	28.07	18.70	12.76
90	8.06	29.38	21.32	14.54
95	5.57	31.88	26.31	17.95
98	2.32	35.13	32.81	22.38
99	-0.18	37.62	37.80	25.79

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	14.06	27.96	13.90	12.36
75	12.20	31.72	19.52	17.48
80	11.46	33.50	22.04	19.81
85	10.44	36.26	25.82	23.36
90	9.52	39.19	29.67	27.04
95	7.98	45.28	37.29	34.55
98	6.37	54.25	47.88	45.49
99	5.38	61.98	56.60	54.96

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	14.32	34.28	19.96	24.51
75	12.47	42.52	30.05	39.63
80	11.76	47.03	35.27	48.25
85	10.82	54.88	44.07	64.02
90	9.98	64.57	54.60	84.65
95	8.61	90.10	81.48	144.35
98	7.19	145.61	138.42	293.68
99	6.31	217.93	211.62	514.48

WAITING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	15.57	23.63	8.06	4.28
75	13.99	25.21	11.22	5.96
80	13.29	25.91	12.62	6.71
85	12.26	26.93	14.67	7.80
90	11.24	27.96	16.72	8.89
95	9.28	29.92	20.64	10.97
98	6.73	32.47	25.73	13.68
99	4.77	34.42	29.65	15.76

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	15.74	26.08	10.35	7.52
75	14.16	28.62	14.46	10.56
80	13.50	29.80	16.29	11.93
85	12.59	31.59	19.01	13.98
90	11.72	33.47	21.74	16.08
95	10.21	37.27	27.06	20.25
98	8.50	42.69	34.19	26.07
99	7.36	47.23	39.87	30.90

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	15.86	29.63	13.77	14.53
75	14.20	34.01	19.81	22.00
80	13.54	36.21	22.67	25.88
85	12.64	39.80	27.17	32.45
90	11.81	43.87	32.06	40.30
95	10.42	53.26	42.84	60.14
98	8.89	69.80	60.90	100.77
99	7.91	87.18	79.26	150.30

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	11.94	25.51	13.57	9.59
75	9.10	28.34	19.24	13.68
80	7.79	29.65	21.86	15.59
85	5.78	31.66	25.88	18.59
90	3.71	33.73	30.02	21.72
95	-0.58	38.03	38.61	28.52
98	-6.93	44.37	51.30	39.45
99	-12.47	49.91	62.38	50.08

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	12.57	31.39	18.82	17.69
75	10.39	37.69	27.30	26.35
80	9.54	40.98	31.44	30.87
85	8.40	46.61	38.20	38.89
90	7.39	53.14	45.75	48.70
95	5.52	70.06	64.54	80.58
98	1.02	107.28	106.26	199.54
99	-9.99	159.99	169.98	480.18

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	12.83	43.97	31.13	47.31
75	10.79	69.32	58.53	127.09
80	10.01	91.27	81.25	226.31
85	8.99	163.51	154.52	713.83
90	8.10	368.45	360.35	2504.24
95	6.67	6501.31	6494.65	77665.75
98	5.21	********	********	*********
99	4.34	********	********	*********

WAITING TIMES EXP/EXP REDF STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	15.54	23.65	8.11	4.28
75	13.95	25.25	11.30	5.96
80	13.24	25.95	12.71	6.71
85	12.21	26.99	14.78	7.80
90	11.17	28.03	16.85	8.89
95	9.19	30.00	20.81	10.97
98	6.61	32.59	25.97	13.69
99	4.63	34.57	29.95	15.77

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	15.71	26.13	10.42	7.52
75	14.12	28.68	14.56	10.57
80	13.46	29.87	16.41	11.94
85	12.54	31.69	19.15	13.99
90	11.67	33.58	21.91	16.10
95	10.15	37.43	27.29	20.27
98	8.42	42.94	34.52	26.10
99	7.28	47.56	40.28	30.95

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	15.83	29.69	13.86	14.54
75	14.16	34.11	19.95	22.03
80	13.50	36.34	22.84	25.92
85	12.59	39.97	27.38	32.50
90	11.76	44.09	32.33	40.36
95	10.36	53.61	43.26	60.25
98	8.83	70.43	61.60	100.96
99	7.84	88.14	80.30	150.61

WAITING TIMES EXP/EXP SCAN STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	12.72	22.95	10.23	7.15
75	10.71	24.96	14.25	9.96
80	9.82	25.85	16.03	11.20
85	8.52	27.15	18.63	13.02
90	7.21	28.45	21.24	14.84
95	4.73	30.94	26.21	18.31
98	1.49	34.18	32.69	22.84
99	-1.00	36.66	37.66	26.31

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	13.20	27.46	14.25	13.12
75	11.34	31.38	20.03	18.58
80	10.61	33.24	22.63	21.08
85	9.61	36.13	26.52	24.87
90	8.70	39.21	30.51	28.83
95	7.21	45.64	38.42	36.92
98	5.68	55.16	49.48	48.77
99	4.76	63.41	58.65	59.09

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	13.46	34.87	21.41	27.49
75	11.61	44.21	32.60	44.98
80	10.90	49.39	38.49	55.10
85	9.98	58.55	48.57	73.79
90	9.16	70.01	60.86	98.52
95	7.84	100.89	93.05	171.19
98	6.49	170.22	163.74	356.59
99	5.66	263.20	257.54	635.10

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	14.69	22.71	8.02	4.33
75	13.11	24.28	11.17	6.03
80	12.42	24.98	12.56	6.78
85	11.39	26.00	14.60	7.88
90	10.37	27.02	16.65	8.98
95	8.42	28.97	20.54	11.08
98	5.89	31.51	25.62	13.82
99	3.94	33.46	29.52	15.93

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	14.85	25.39	10.54	7.80
75	13.27	28.00	14.73	10.97
80	12.61	29.21	16.60	12.39
85	11.70	31.07	19.37	14.53
90	10.84	33.01	22.17	16.72
95	9.35	36.96	27.61	21.06
98	7.68	42.61	34.93	27.15
99	6.58	47.35	40.77	32.21

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	14.97	29.42	14.45	15.78
75	13.29	34.17	20.88	24.02
80	12.63	36.57	23.94	28.32
85	11.72	40.51	28.78	35.64
90	10.90	45.00	34.10	44.43
95	9.53	55.48	45.95	66.80
98	8.05	74.22	66.17	112.89
99	7.10	94.19	87.09	169.29

WAITING TIMES EXP/EXP DELZ STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	12.93	26.61	13.68	10.50
75	9.96	29.58	19.62	15.22
80	8.55	30.98	22.43	17.52
85	6.34	33.19	26.85	21.27
90	4.03	35.51	31.48	25.25
95	-1.01	40.55	41.56	34.61
98	-8.99	48.52	57.51	51.30
99	-16.46	56.00	72.46	69.08

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	13.72	34.35	20.63	21.93
75	11.11	41.24	30.13	32.70
80	10.07	44.90	34.82	38.26
85	8.67	51.22	42.55	47.80
90	7.46	58.66	51.20	59.22
95	5.58	78.37	72.79	91.06
98	3.16	122.67	119.52	177.31
99	-2.27	185.22	187.49	337.44

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	14.08	66.20	52.12	221.06
75	11.49	131.52	120.02	771.63
80	10.53	197.12	186.59	1418.42
85	9.26	395.37	386.12	3541.97
90	8.18	1010.29	1002.10	10849.13
95	6.49	9177.57	9171.08	115493.25
98	4.84	********	********	*********
99	3.90	********	********	*********

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.12	12.27	5.15	3.60
75	6.11	13.28	7.18	5.02
80	5.66	13.73	8.07	5.64
85	5.01	14.39	9.38	6.56
90	4.35	15.04	10.69	7.48
95	3.10	16.30	13.20	9.23
98	1.47	17.93	16.46	11.51
99	0.22	19.18	18.96	13.26

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.36	14.24	6.88	6.65
75	6.42	16.08	9.66	9.43
80	6.05	16.96	10.91	10.71
85	5.54	18.31	12.77	12.65
90	5.07	19.74	14.68	14.69
95	4.28	22.71	18.44	18.87
98	3.44	27.09	23.65	25.06
99	2.91	30.86	27.95	30.50

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.48	17.70	10.22	17.20
75	6.56	22.24	15.69	30.15
80	6.20	24.82	18.62	38.27
85	5.72	29.48	23.76	54.21
90	5.29	35.50	30.21	76.80
95	4.59	52.66	48.07	150.06
98	3.85	95.32	91.46	363.77
99	3.39	159.07	155.68	723.57

AVE WAITING TIMES   EXP/EXP   ORIG   STRA/ANTI   19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.11	12.45	4.35	2.23
75	7.25	13.31	6.05	3.10
80	6.88	13.69	6.81	3.49
85	6.32	14.24	7.92	4.05
90	5.77	14.79	9.02	4.62
95	4.71	15.85	11.14	5.70
98	3.34	17.23	13.89	7.11
99	2.28	18.28	16.00	8.19

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.20	13.62	5.42	3.74
75	7.37	14.95	7.58	5.25
80	7.03	15.56	8.53	5.93
85	6.55	16.50	9.95	6.94
90	6.09	17.48	11.38	7.98
95	5.30	19.46	14.16	10.03
98	4.40	22.29	17.89	12.88
99	3.80	24.65	20.85	15.22

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.25	15.23	6.98	7.09
75	7.40	17.40	10.00	10.69
80	7.05	18.48	11.43	12.55
85	6.59	20.24	13.65	15.68
90	6.15	22.21	16.05	19.39
95	5.43	26.70	21.27	28.65
98	4.63	34.42	29.79	47.21
99	4.11	42.34	38.22	69.28

AVE WAITING TIMES EXP/EXP REDF STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	6.88	12.52	5.64	3.94
75	5.75	13.64	7.89	5.51
80	5.25	14.14	8.89	6.21
85	4.51	14.88	10.38	7.26
90	3.75	15.64	11.88	8.31
95	2.30	17.10	14.80	10.36
98	0.34	19.05	18.71	13.13
99	-1.20	20.60	21.80	15.33

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	7.12	14.69	7.56	7.37
75	6.13	16.81	10.68	10.56
80	5.73	17.85	12.11	12.07
85	5.19	19.47	14.27	14.43
90	4.70	21.22	16.52	16.96
95	3.88	25.00	21.12	22.46
98	3.01	30.90	27.89	31.47
99	2.45	36.33	33.88	40.38

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	7.25	18.86	11.61	21.33
75	6.28	24.89	18.61	41.65
80	5.91	28.63	22.72	56.35
85	5.41	35.97	30.56	89.14
90	4.97	46.49	41.52	142.46
95	4.24	83.87	79.63	370.99
98	3.48	225.60	222.12	1436.35
99	3.00	572.58	569.58	4372.69

AVE WAITING TIMES EXP/EXP REDF STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.11	12.45	4.35	2.23
75	7.25	13.31	6.05	3.10
80	6.88	13.69	6.81	3.49
85	6.32	14.24	7.92	4.05
90	5.77	14.79	9.02	4.62
95	4.71	15.85	11.14	5.70
98	3.34	17.23	13.89	7.11
99	2.28	18.28	16.00	8.19

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.20	13.62	5.42	3.74
75	7.37	14.95	7.58	5.25
80	7.03	15.56	8.53	5.93
85	6.55	16.50	9.95	6.94
90	6.09	17.48	11.38	7.98
95	5.30	19.46	14.16	10.03
98	4.40	22.29	17.89	12.88
99	3.80	24.65	20.85	15.22

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.25	15.23	6.98	7.09
75	7.40	17.40	10.00	10.69
80	7.05	18.48	11.43	12.55
85	6.59	20.24	13.65	15.68
90	6.15	22.21	16.05	19.39
95	5.43	26.70	21.27	28.65
98	4.63	34.42	29.79	47.21
99	4.11	42.34	38.22	69.28

AVE WAITING TIMES   EXP/EXP   SCAN   STRA   19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	6.98	12.14	5.16	3.62
75	5.97	13.15	7.18	5.05
80	5.52	13.59	8.08	5.68
85	4.86	14.25	9.39	6.60
90	4.21	14.91	10.70	7.52
95	2.95	16.16	13.21	9.28
98	1.32	17.79	16.47	11.58
99	0.07	19.05	18.98	13.34

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	7.22	14.17	6.95	6.80
75	6.28	16.05	9.76	9.65
80	5.91	16.93	11.03	10.96
85	5.40	18.31	12.91	12.95
90	4.93	19.77	14.84	15.05
95	4.14	22.80	18.66	19.37
98	3.31	27.28	23.96	25.77
99	2.80	31.14	28.34	31.42

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	7.34	17.94	10.60	18.88
75	6.41	22.85	16.44	33.84
80	6.06	25.68	19.62	43.43
85	5.58	30.86	25.28	62.59
90	5.15	37.67	32.51	90.29
95	4.46	57.61	53.15	182.79
98	3.73	109.37	105.64	464.14
99	3.27	190.10	186.83	956.27

AVE WAITING TIMES   EXP/EXP   SCAN   STRA/ANTI   19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	7.99	12.32	4.33	2.25
75	7.14	13.17	6.03	3.13
80	6.77	13.54	6.77	3.52
85	6.22	14.09	7.88	4.09
90	5.67	14.65	8.98	4.66
95	4.62	15.70	11.08	5.75
98	3.25	17.07	13.82	7.17
99	2.20	18.12	15.92	8.27

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	8.08	13.54	5.45	3.84
75	7.25	14.88	7.63	5.39
80	6.91	15.50	8.59	6.09
85	6.43	16.45	10.02	7.13
90	5.98	17.44	11.46	8.19
95	5.19	19.45	14.27	10.30
98	4.29	22.32	18.03	13.23
99	3.70	24.73	21.02	15.65

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	8.13	15.27	7.14	7.42
75	7.27	17.53	10.26	11.22
80	6.93	18.66	11.74	13.19
85	6.46	20.50	14.04	16.50
90	6.03	22.58	16.55	20.44
95	5.30	27.34	22.03	30.29
98	4.52	35.61	31.10	50.10
99	4.01	44.18	40.17	73.70

AVE WAITING TIMES   EXP/EXP   DELZ   STRA   19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	7.04	12.67	5.63	4.07
75	5.90	13.80	7.90	5.71
80	5.39	14.32	8.93	6.46
85	4.62	15.08	10.46	7.56
90	3.84	15.86	12.02	8.69
95	2.30	17.40	15.11	10.93
98	0.18	19.53	19.35	14.04
99	-1.54	21.25	22.79	16.62

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	7.32	15.12	7.81	8.32
75	6.28	17.35	11.07	11.96
80	5.86	18.44	12.58	13.71
85	5.29	20.18	14.90	16.46
90	4.76	22.08	17.32	19.45
95	3.89	26.30	22.41	26.19
98	2.93	33.28	30.35	38.36
99	2.21	40.29	38.08	53.86

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	7.46	20.85	13.39	31.36
75	6.43	28.66	22.23	63.79
80	6.03	33.77	27.74	88.03
85	5.50	44.46	38.96	144.58
90	5.03	60.69	55.66	239.14
95	4.25	128.81	124.56	684.81
98	3.44	592.41	588.97	4013.77
99	2.93	7653.04	7650.10	90873.25

MAX WAITING TIMES EXP/EXP ORIG STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	14.22	23.43	9.20	6.15
75	12.42	25.24	12.82	8.56
80	11.62	26.03	14.42	9.63
85	10.45	27.21	16.76	11.19
90	9.27	28.38	19.11	12.76
95	7.04	30.61	23.58	15.74
98	4.12	33.53	29.40	19.63
99	1.89	35.76	33.88	22.62

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	14.62	26.11	11.48	9.80
75	12.97	29.05	16.08	13.81
80	12.30	30.44	18.14	15.62
85	11.37	32.56	21.19	18.36
90	10.50	34.79	24.29	21.18
95	9.02	39.38	30.36	26.85
98	7.39	46.03	38.64	34.94
99	6.35	51.68	45.33	41.79

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	14.85	29.26	14.41	15.74
75	13.23	34.16	20.93	23.99
80	12.59	36.66	24.08	28.30
85	11.72	40.81	29.10	35.65
90	10.93	45.60	34.67	44.48
95	9.60	56.95	47.35	66.88
98	8.18	77.77	69.59	112.66
99	7.26	100.49	93.23	168.00

MAX WAITING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	15.81	23.31	7.50	3.85
75	14.34	24.78	10.44	5.36
80	13.69	25.43	11.74	6.02
85	12.74	26.39	13.65	7.00
90	11.78	27.34	15.56	7.98
95	9.96	29.16	19.21	9.85
98	7.59	31.54	23.95	12.29
99	5.76	33.36	27.59	14.16

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	16.00	24.88	8.88	6.01
75	14.60	26.99	12.40	8.43
80	14.01	27.97	13.96	9.51
85	13.18	29.44	16.27	11.13
90	12.39	30.98	18.59	12.78
95	10.99	34.07	23.08	16.03
98	9.37	38.44	29.07	20.51
99	8.26	42.05	33.79	24.18

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	16.14	26.71	10.57	9.86
75	14.71	29.72	15.01	14.55
80	14.13	31.19	17.05	16.88
85	13.33	33.51	20.18	20.69
90	12.58	36.05	23.47	25.03
95	11.29	41.61	30.32	35.25
98	9.84	50.61	40.77	53.98
99	8.87	59.24	50.37	74.41

MAX WAITING TIMES EXP/EXP REDF STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	13.79	23.86	10.07	6.64
75	11.79	25.87	14.08	9.28
80	10.89	26.76	15.88	10.47
85	9.56	28.09	18.53	12.22
90	8.22	29.43	21.22	13.99
95	5.61	32.04	26.43	17.44
98	2.12	35.53	33.42	22.08
99	-0.64	38.29	38.94	25.78

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	14.22	26.79	12.58	10.62
75	12.45	30.15	17.70	15.06
80	11.72	31.76	20.03	17.11
85	10.73	34.26	23.53	20.25
90	9.80	36.95	27.15	23.55
95	8.23	42.63	34.40	30.42
98	6.52	51.31	44.79	40.92
99	5.45	59.12	53.67	50.61

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	14.45	30.36	15.91	17.39
75	12.73	36.16	23.43	27.17
80	12.05	39.25	27.20	32.58
85	11.14	44.52	33.38	42.20
90	10.30	50.84	40.54	54.38
95	8.91	67.03	58.12	89.04
98	7.41	101.58	94.16	177.27
99	6.46	147.55	141.09	318.49

MAX WAITING TIMES EXP/EXP REDF STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	15.81	23.31	7.50	3.84
75	14.34	24.79	10.45	5.36
80	13.69	25.44	11.75	6.02
85	12.73	26.39	13.66	7.00
90	11.77	27.35	15.58	7.98
95	9.95	29.17	19.22	9.85
98	7.57	31.55	23.98	12.28
99	5.75	33.37	27.62	14.15

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	16.00	24.88	8.88	6.01
75	14.59	27.00	12.40	8.42
80	14.01	27.97	13.97	9.51
85	13.18	29.45	16.28	11.12
90	12.38	30.99	18.61	12.77
95	10.98	34.08	23.10	16.02
98	9.36	38.45	29.10	20.50
99	8.25	42.07	33.82	24.17

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	16.13	26.71	10.58	9.85
75	14.71	29.73	15.02	14.55
80	14.13	31.19	17.06	16.88
85	13.32	33.51	20.19	20.68
90	12.58	36.06	23.48	25.02
95	11.28	41.63	30.35	35.24
98	9.83	50.64	40.80	53.97
99	8.87	59.28	50.41	74.40

MAX WAITING TIMES EXP/EXP SCAN STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	13.70	22.91	9.20	6.27
75	11.89	24.71	12.82	8.73
80	11.10	25.51	14.42	9.82
85	9.92	26.68	16.76	11.41
90	8.75	27.86	19.11	13.01
95	6.51	30.09	23.58	16.05
98	3.60	33.01	29.41	20.02
99	1.36	35.24	33.88	23.07

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	14.11	25.79	11.68	10.26
75	12.45	28.82	16.37	14.47
80	11.78	30.24	18.46	16.38
85	10.85	32.43	21.58	19.27
90	9.99	34.74	24.75	22.25
95	8.53	39.50	30.97	28.27
98	6.95	46.43	39.48	36.89
99	5.94	52.33	46.39	44.24

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	14.34	29.37	15.03	17.37
75	12.70	34.68	21.98	26.86
80	12.06	37.44	25.37	31.94
85	11.20	42.05	30.85	40.75
90	10.42	47.44	37.02	51.57
95	9.11	60.50	51.38	79.98
98	7.72	85.30	77.58	141.14
99	6.84	113.38	106.54	218.82

MAX WAITING TIMES EXP/EXP SCAN STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	15.38	22.79	7.42	3.90
75	13.92	24.25	10.33	5.43
80	13.27	24.89	11.62	6.11
85	12.33	25.84	13.51	7.10
90	11.38	26.78	15.40	8.09
95	9.58	28.59	19.00	9.99
98	7.23	30.93	23.70	12.45
99	5.43	32.74	27.30	14.35

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	15.56	24.46	8.90	6.21
75	14.16	26.59	12.43	8.71
80	13.58	27.58	14.00	9.83
85	12.75	29.07	16.32	11.51
90	11.97	30.62	18.66	13.22
95	10.58	33.75	23.17	16.59
98	8.98	38.18	29.20	21.24
99	7.90	41.85	33.96	25.06

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	15.69	26.47	10.78	10.43
75	14.26	29.59	15.33	15.44
80	13.68	31.11	17.43	17.94
85	12.88	33.54	20.66	22.03
90	12.14	36.21	24.07	26.72
95	10.86	42.09	31.23	37.81
98	9.43	51.70	42.27	58.28
99	8.48	61.01	52.53	80.75

MAX WAITING TIMES EXP/EXP DELZ STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	13.24	23.50	10.26	7.03
75	11.17	25.57	14.40	9.87
80	10.23	26.51	16.28	11.15
85	8.83	27.91	19.08	13.07
90	7.41	29.33	21.92	15.02
95	4.59	32.14	27.55	18.90
98	0.71	36.03	35.32	24.35
99	-2.45	39.18	41.63	28.95

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	13.74	27.27	13.53	12.61
75	11.87	31.02	19.15	18.01
80	11.11	32.85	21.74	20.56
85	10.05	35.74	25.69	24.51
90	9.08	38.87	29.79	28.74
95	7.44	45.72	38.29	37.94
98	5.69	56.79	51.10	53.29
99	4.56	67.46	62.90	69.82

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	14.01	32.86	18.85	25.59
75	12.16	40.72	28.56	42.54
80	11.44	45.16	33.73	52.88
85	10.46	53.18	42.72	73.23
90	9.59	63.44	53.85	101.85
95	8.14	93.77	85.63	203.31
98	6.59	181.50	174.91	588.02
99	5.62	369.91	364.29	1606.86

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	8.96	12.77	3.81	1.60
75	8.22	13.52	5.30	2.24
80	7.89	13.85	5.96	2.51
85	7.40	14.33	6.93	2.92
90	6.92	14.82	7.90	3.33
95	5.99	15.74	9.75	4.11
98	4.79	16.95	12.16	5.13
99	3.86	17.87	14.01	5.91

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	9.11	13.36	4.26	2.48
75	8.42	14.37	5.94	3.49
80	8.14	14.83	6.69	3.94
85	7.73	15.53	7.80	4.63
90	7.34	16.26	8.92	5.34
95	6.65	17.72	11.07	6.76
98	5.83	19.78	13.95	8.77
99	5.27	21.49	16.22	10.47

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	9.20	13.96	4.76	3.89
75	8.53	15.30	6.77	5.91
80	8.26	15.95	7.69	6.96
85	7.88	16.99	9.11	8.75
90	7.52	18.13	10.61	10.90
95	6.88	20.66	13.78	16.32
98	6.16	24.87	18.71	27.39
99	5.66	29.08	23.42	40.72

WAITING TIMES EXP/CONS ORIG STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	9.45	12.62	3.17	1.08
75	8.83	13.24	4.41	1.50
80	8.55	13.51	4.96	1.69
85	8.15	13.92	5.77	1.96
90	7.74	14.32	6.58	2.24
95	6.97	15.09	8.12	2.76
98	5.97	16.09	10.12	3.44
99	5.20	16.86	11.66	3.97

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	9.52	13.07	3.55	1.59
75	8.92	13.88	4.96	2.22
80	8.66	14.24	5.58	2.51
85	8.30	14.79	6.49	2.93
90	7.95	15.36	7.41	3.35
95	7.31	16.49	9.18	4.19
98	6.54	18.04	11.51	5.32
99	5.99	19.31	13.32	6.24

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	9.58	13.51	3.93	2.20
75	8.98	14.50	5.52	3.16
80	8.73	14.96	6.23	3.62
85	8.37	15.68	7.31	4.34
90	8.04	16.44	8.40	5.13
95	7.44	18.03	10.59	6.85
98	6.73	20.40	13.67	9.70
99	6.25	22.50	16.26	12.53

WAITING TIMES EXP/CONS REDF - STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	8.52	13.21	4.69	2.39
75	7.56	14.17	6.62	3.46
80	7.12	14.62	7.50	3.98
85	6.45	15.28	8.83	4.83
90	5.76	15.97	10.21	5.73
95	4.37	17.36	13.00	7.85
98	2.36	19.37	17.01	11.61
99	0.65	21.08	20.44	15.61

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	8.71	14.01	5.31	3.73
75	7.89	15.44	7.55	5.59
80	7.55	16.15	8.60	6.57
85	7.06	17.30	10.24	8.39
90	6.60	18.57	11.98	10.58
95	5.76	21.63	15.87	18.01
98	4.53	27.70	23.17	45.43
99	2.81	35.72	32.91	108.01

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	8.81	14.97	6.16	6.59
75	8.03	17.33	9.29	12.72
80	7.71	18.76	11.05	17.79
85	7.27	21.83	14.57	33.75
90	6.85	26.79	19.95	68.42
95	6.11	65.88	59.78	508.93
98	5.25	1937.53	1932.27	26536.98
99	4.68	********	********	*********

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	9.44	12.62	3.18	1.08
75	8.82	13.24	4.42	1.50
80	8.54	13.52	4.97	1.69
85	8.14	13.92	5.78	1.96
90	7.73	14.33	6.59	2.24
95	6.96	15.10	8.14	2.76
98	5.96	16.11	10.15	3.44
99	5.18	16.88	11.70	3.97

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	9.52	13.08	3.56	1.59
75	8.91	13.88	4.97	2.22
80	8.66	14.25	5.59	2.51
85	8.29	14.80	6.51	2.93
90	7.94	15.37	7.43	3.35
95	7.30	16.50	9.20	4.19
98	6.52	18.07	11.54	5.32
99	5.98	19.34	13.36	6.24

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	9.58	13.51	3.94	2.20
75	8.97	14.50	5.53	3.16
80	8.72	14.97	6.25	3.62
85	8.37	15.69	7.32	4.34
90	8.03	16.46	8.43	5.13
95	7.43	18.05	10.62	6.85
98	6.72	20.44	13.71	9.70
99	6.23	22.55	16.31	12.53

WAITING TIMES EXP/CONS SCAN STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.14	11.86	3.72	1.65
75	7.41	12.59	5.18	2.31
80	7.09	12.91	5.82	2.59
85	6.61	13.38	6.77	3.01
90	6.14	13.86	7.72	3.44
95	5.24	14.76	9.52	4.24
98	4.06	15.94	11.88	5.29
99	3.16	16.84	13.68	6.09

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.28	12.52	4.23	2.61
75	7.62	13.53	5.91	3.68
80	7.34	14.00	6.66	4.17
85	6.94	14.71	7.76	4.90
90	6.57	15.45	8.88	5.65
95	5.91	16.94	11.04	7.16
98	5.13	19.06	13.93	9.32
99	4.60	20.82	16.21	11.14

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.37	13.20	4.83	4.26
75	7.72	14.61	6.88	6.53
80	7.46	15.30	7.84	7.73
85	7.09	16.41	9.32	9.79
90	6.74	17.65	10.91	12.30
95	6.14	20.45	14.31	18.78
98	5.45	25.23	19.78	32.39
99	4.99	30.16	25.18	49.24

WAITING TIMES   EXP/CONS   SCAN   STRA/ANTI   19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.76	11.80	3.04	1.05
75	8.16	12.40	4.24	1.46
80	7.90	12.67	4.77	1.64
85	7.51	13.05	5.54	1.90
90	7.12	13.44	6.32	2.17
95	6.38	14.18	7.80	2.68
98	5.42	15.14	9.72	3.34
99	4.68	15.88	11.20	3.85

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.82	12.28	3.46	1.57
75	8.24	13.07	4.83	2.20
80	7.99	13.43	5.44	2.48
85	7.64	13.97	6.33	2.89
90	7.30	14.53	7.23	3.32
95	6.69	15.63	8.95	4.14
98	5.95	17.17	11.22	5.26
99	5.43	18.42	13.00	6.16

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.87	12.75	3.88	2.20
75	8.28	13.74	5.45	3.17
80	8.04	14.20	6.16	3.63
85	7.70	14.92	7.23	4.34
90	7.37	15.69	8.32	5.12
95	6.80	17.30	10.50	6.81
98	6.12	19.71	13.59	9.56
99	5.66	21.86	16.20	12.25

WAITING TIMES EXP/CONS DELZ STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	6.98	11.92	4.94	2.76
75	5.94	12.96	7.02	4.04
80	5.45	13.44	7.99	4.68
85	4.70	14.19	9.49	5.77
90	3.93	14.97	11.04	6.90
95	2.30	16.60	14.30	9.73
98	-0.18	19.08	19.26	15.05
99	-2.41	21.31	23.73	20.92

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	7.24	13.63	6.38	6.87
75	6.33	15.56	9.23	10.79
80	5.95	16.56	10.61	13.03
85	5.42	18.32	12.90	17.63
90	4.94	20.32	15.38	23.19
95	4.06	25.78	21.72	44.03
98	2.35	39.03	36.68	121.98
99	-1.73	60.03	61.76	296.78

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	7.37	26.49	19.12	157.74
75	6.48	69.26	62.78	709.19
80	6.13	131.04	124.91	1545.99
85	5.65	484.74	479.10	6449.11
90	5.21	1946.50	1941.29	26896.13
95	4.46	87250.13	87244.19	*********
98	3.64	********	********	*********
99	3.12	********	********	*********

AVE WAITING TIMES EXP/CONS ORIG STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	4.39	6.30	1.91	0.79
75	4.01	6.67	2.66	1.10
80	3.85	6.84	2.99	1.24
85	3.60	7.08	3.48	1.44
90	3.36	7.32	3.96	1.65
95	2.90	7.79	4.89	2.03
98	2.29	8.39	6.10	2.53
99	1.83	8.85	7.03	2.92

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	4.46	6.58	2.12	1.19
75	4.12	7.08	2.96	1.67
80	3.98	7.31	3.33	1.89
85	3.78	7.66	3.88	2.22
90	3.58	8.02	4.44	2.56
95	3.23	8.74	5.51	3.23
98	2.82	9.76	6.94	4.18
99	2.54	10.60	8.06	4.97

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	4.51	6.85	2.35	1.78
75	4.18	7.50	3.32	2.67
80	4.04	7.81	3.77	3.12
85	3.85	8.31	4.46	3.88
90	3.67	8.85	5.18	4.77
95	3.35	10.02	6.67	6.97
98	2.99	11.94	8.95	11.25
99	2.74	13.79	11.06	16.22

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.54	6.23	1.69	0.52
75	4.21	6.56	2.35	0.72
80	4.06	6.71	2.65	0.81
85	3.85	6.92	3.08	0.94
90	3.63	7.14	3.51	1.08
95	3.22	7.55	4.33	1.33
98	2.69	8.08	5.40	1.65
99	2.28	8.49	6.22	1.91

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.59	6.44	1.85	0.72
75	4.28	6.87	2.58	1.01
80	4.15	7.06	2.91	1.13
85	3.96	7.35	3.38	1.32
90	3.78	7.64	3.86	1.52
95	3.45	8.24	4.78	1.90
98	3.06	9.06	6.00	2.41
99	2.78	9.73	6.95	2.82

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.63	6.63	2.00	0.94
75	4.32	7.13	2.81	1.35
80	4.19	7.37	3.18	1.55
85	4.01	7.74	3.72	1.85
90	3.84	8.12	4.28	2.18
95	3.54	8.93	5.39	2.90
98	3.18	10.13	6.95	4.07
99	2.94	11.18	8.25	5.21

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.34	6.35	2.01	0.85
75	3.94	6.74	2.80	1.19
80	3.76	6.92	3.16	1.35
85	3.50	7.18	3.68	1.57
90	3.24	7.44	4.20	1.80
95	2.73	7.95	5.21	2.24
98	2.07	8.62	6.55	2.84
99	1.54	9.14	7.59	3.31

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.42	6.65	2.23	1.27
75	4.06	7.18	3.12	1.79
80	3.91	7.43	3.52	2.03
85	3.69	7.81	4.12	2.39
90	3.49	8.21	4.72	2.77
95	3.12	9.02	5.89	3.54
98	2.69	10.18	7.49	4.66
99	2.39	11.17	8.78	5.63

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.46	6.94	2.48	1.90
75	4.12	7.64	3.52	2.88
80	3.97	7.98	4.01	3.40
85	3.77	8.54	4.76	4.28
90	3.58	9.15	5.56	5.34
95	3.25	10.52	7.27	8.05
98	2.87	12.87	10.00	13.73
99	2.61	15.29	12.68	20.84

AVE WAITING TIMES EXP/CONS REDF STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.54	6.23	1.69	0.52
75	4.21	6.56	2.35	0.72
80	4.06	6.71	2.65	0.81
85	3.85	6.92	3.08	0.94
90	3.63	7.14	3.51	1.08
95	3.22	7.55	4.33	1.33
98	2.69	8.08	5.40	1.65
99	2.28	8.49	6.22	1.91

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.59	6.44	1.85	0.72
75	4.28	6.87	2.58	1.01
80	4.15	7.06	2.91	1.13
85	3.96	7.35	3.38	1.32
90	3.78	7.64	3.86	1.52
95	3.45	8.24	4.78	1.90
98	3.06	9.06	6.00	2.41
99	2.78	9.73	6.95	2.82

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.63	6.63	2.00	0.94
75	4.32	7.13	2.81	1.35
80	4.19	7.37	3.18	1.55
85	4.01	7.74	3.72	1.85
90	3.84	8.12	4.28	2.18
95	3.54	8.93	5.39	2.90
98	3.18	10.13	6.95	4.07
99	2.94	11.18	8.25	5.21

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.28	6.16	1.88	0.81
75	3.91	6.52	2.62	1.13
80	3.75	6.69	2.94	1.27
85	3.51	6.93	3.42	1.48
90	3.27	7.17	3.90	1.69
95	2.81	7.62	4.81	2.08
98	2.22	8.22	6.00	2.60
99	1.76	8.67	6.91	2.99

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.35	6.45	2.10	1.23
75	4.02	6.95	2.93	1.74
80	3.88	7.17	3.30	1.96
85	3.68	7.52	3.84	2.31
90	3.48	7.88	4.39	2.66
95	3.14	8.60	5.46	3.36
98	2.74	9.62	6.87	4.35
99	2.47	10.46	7.99	5.18

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	4.40	6.73	2.34	1.89
75	4.07	7.39	3.32	2.85
80	3.93	7.70	3.77	3.35
85	3.75	8.21	4.46	4.18
90	3.57	8.76	5.19	5.17
95	3.26	9.98	6.72	7.65
98	2.90	11.99	9.08	12.61
99	2.66	13.97	11.31	18.48

AVE WAITING TIMES EXP/CONS SCAN STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.46	6.09	1.63	0.50
75	4.14	6.42	2.28	0.69
80	4.00	6.56	2.56	0.78
85	3.79	6.76	2.97	0.90
90	3.58	6.97	3.39	1.03
95	3.19	7.37	4.18	1.27
98	2.67	7.89	5.22	1.58
99	2.27	8.28	6.01	1.82

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.51	6.30	1.79	0.69
75	4.21	6.71	2.50	0.97
80	4.08	6.90	2.82	1.09
85	3.90	7.18	3.28	1.27
90	3.72	7.46	3.74	1.46
95	3.40	8.04	4.63	1.82
98	3.02	8.83	5.81	2.31
99	2.75	9.47	6.73	2.70

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.54	6.49	1.95	0.91
75	4.24	6.97	2.73	1.30
80	4.12	7.20	3.08	1.49
85	3.94	7.56	3.61	1.78
90	3.78	7.93	4.15	2.09
95	3.48	8.71	5.23	2.76
98	3.13	9.86	6.73	3.84
99	2.89	10.87	7.98	4.88

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.08	6.07	1.99	0.88
75	3.68	6.47	2.79	1.24
80	3.50	6.65	3.15	1.40
85	3.24	6.91	3.67	1.63
90	2.97	7.18	4.21	1.87
95	2.45	7.70	5.25	2.34
98	1.75	8.39	6.64	2.98
99	1.20	8.95	7.75	3.50

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.16	6.42	2.25	1.40
75	3.81	6.96	3.16	1.98
80	3.65	7.22	3.57	2.25
85	3.44	7.62	4.18	2.66
90	3.23	8.03	4.80	3.08
95	2.86	8.89	6.04	3.96
98	2.42	10.16	7.74	5.27
99	2.12	11.26	9.15	6.44

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	4.21	6.77	2.55	2.34
75	3.86	7.52	3.66	3.65
80	3.72	7.90	4.18	4.36
85	3.52	8.52	5.00	5.61
90	3.33	9.22	5.90	7.19
95	2.99	10.86	7.87	11.47
98	2.61	13.85	11.24	21.28
99	2.34	17.18	14.84	34.60

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.16	11.62	3.46	1.24
75	7.48	12.30	4.82	1.72
80	7.18	12.60	5.42	1.94
85	6.74	13.04	6.30	2.25
90	6.30	13.48	7.18	2.57
95	5.46	14.32	8.86	3.17
98	4.36	15.42	11.05	3.95
99	3.52	16.26	12.74	4.56

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.30	12.04	3.74	1.64
75	7.68	12.90	5.22	2.30
80	7.42	13.29	5.87	2.59
85	7.05	13.89	6.84	3.03
90	6.70	14.51	7.81	3.48
95	6.06	15.74	9.68	4.36
98	5.30	17.45	12.15	5.56
99	4.77	18.85	14.09	6.55

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.39	12.39	4.00	2.11
75	7.79	13.42	5.63	3.06
80	7.54	13.91	6.37	3.52
85	7.19	14.67	7.48	4.26
90	6.86	15.48	8.62	5.07
95	6.28	17.18	10.90	6.91
98	5.61	19.75	14.15	10.10
99	5.14	22.06	16.92	13.42

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.47	11.62	3.15	0.99
75	7.85	12.24	4.39	1.38
80	7.57	12.51	4.94	1.55
85	7.17	12.91	5.74	1.80
90	6.77	13.31	6.54	2.05
95	6.00	14.08	8.07	2.54
98	5.01	15.07	10.07	3.16
99	4.24	15.84	11.60	3.64

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.57	11.97	3.39	1.30
75	8.00	12.73	4.73	1.82
80	7.76	13.08	5.33	2.06
85	7.41	13.61	6.20	2.40
90	7.08	14.15	7.08	2.75
95	6.47	15.23	8.76	3.44
98	5.74	16.73	10.99	4.38
99	5.22	17.94	12.72	5.15

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.65	12.27	3.62	1.67
75	8.09	13.17	5.09	2.41
80	7.85	13.60	5.74	2.77
85	7.52	14.25	6.72	3.34
90	7.21	14.94	7.73	3.97
95	6.65	16.37	9.72	5.38
98	5.99	18.50	12.51	7.82
99	5.54	20.37	14.83	10.37

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	8.08	11.70	3.62	1.30
75	7.37	12.41	5.04	1.81
80	7.05	12.73	5.68	2.04
85	6.58	13.20	6.62	2.38
90	6.11	13.67	7.56	2.72
95	5.21	14.57	9.37	3.38
98	4.01	15.77	11.75	4.26
99	3.08	16.70	13.61	4.96

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	8.23	12.13	3.91	1.70
75	7.59	13.04	5.46	2.39
80	7.31	13.47	6.15	2.70
85	6.92	14.10	7.18	3.17
90	6.55	14.77	8.22	3.65
95	5.88	16.11	10.23	4.60
98	5.07	18.02	12.94	5.94
99	4.51	19.61	15.10	7.06

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
60	8.32	12.50	4.18	2.18
75	7.70	13.60	5.90	3.18
80	7.44	14.12	6.69	3.67
85	7.07	14.94	7.87	4.45
90	6.73	15.83	9.10	5.32
95	6.12	17.71	11.58	7.32
98	5.41	20.63	15.22	10.87
99	4.92	23.33	18.41	14.65

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.47	11.62	3.15	0.99
75	7.85	12.24	4.39	1.38
80	7.57	12.51	4.94	1.55
85	7.17	12.91	5.74	1.80
90	6.77	13.31	6.54	2.05
95	6.00	14.08	8.07	2.54
98	5.01	15.07	10.07	3.16
99	4.24	15.84	11.60	3.64

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.57	11.97	3.39	1.30
75	8.00	12.73	4.73	1.82
80	7.76	13.08	5.33	2.06
85	7.41	13.61	6.20	2.40
90	7.08	14.15	7.08	2.75
95	6.47	15.23	8.76	3.44
98	5.74	16.73	10.99	4.38
99	5.22	17.94	12.72	5.15

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	8.65	12.27	3.62	1.67
75	8.09	13.17	5.09	2.41
80	7.85	13.60	5.74	2.77
85	7.52	14.25	6.72	3.34
90	7.21	14.94	7.73	3.97
95	6.65	16.37	9.72	5.38
98	5.99	18.50	12.51	7.82
99	5.54	20.37	14.83	10.37

MAX WAITING TIMES   EXP/CONS   SCAN   STRA   19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.73	11.02	3.29	1.30
75	7.08	11.67	4.59	1.81
80	6.80	11.96	5.16	2.03
85	6.38	12.38	6.00	2.36
90	5.96	12.80	6.84	2.70
95	5.16	13.60	8.44	3.33
98	4.11	14.64	10.53	4.15
99	3.31	15.44	12.13	4.78

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.86	11.45	3.59	1.76
75	7.27	12.28	5.01	2.48
80	7.02	12.67	5.64	2.79
85	6.67	13.24	6.57	3.27
90	6.33	13.84	7.51	3.75
95	5.73	15.03	9.31	4.71
98	5.01	16.70	11.69	6.03
99	4.51	18.07	13.56	7.11

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.94	11.82	3.88	2.34
75	7.37	12.84	5.47	3.41
80	7.13	13.32	6.19	3.94
85	6.80	14.08	7.27	4.79
90	6.49	14.88	8.39	5.74
95	5.94	16.60	10.66	7.94
98	5.30	19.23	13.93	11.86
99	4.86	21.63	16.77	16.06

MAX WAITING TIMES EXP/CONS SCAN STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	8.14	11.12	2.98	0.94
75	7.56	11.71	4.15	1.31
80	7.30	11.97	4.67	1.47
85	6.92	12.35	5.43	1.71
90	6.54	12.73	6.19	1.95
95	5.82	13.45	7.63	2.41
98	4.87	14.39	9.52	3.00
99	4.15	15.12	10.97	3.46

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	8.24	11.45	3.21	1.23
75	7.70	12.18	4.48	1.72
80	7.47	12.51	5.05	1.94
85	7.14	13.01	5.87	2.26
90	6.82	13.52	6.70	2.59
95	6.24	14.54	8.30	3.24
98	5.55	15.95	10.40	4.11
99	5.05	17.10	12.04	4.82

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
60	8.30	11.74	3.44	1.54
75	7.77	12.59	4.82	2.22
80	7.55	12.99	5.44	2.54
85	7.24	13.61	6.37	3.04
90	6.94	14.26	7.32	3.58
95	6.40	15.60	9.20	4.77
98	5.78	17.59	11.81	6.75
99	5.34	19.32	13.98	8.73

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.00	10.55	3.55	1.52
75	6.30	11.26	4.97	2.13
80	5.98	11.58	5.60	2.41
85	5.51	12.05	6.54	2.81
90	5.03	12.52	7.49	3.23
95	4.11	13.45	9.34	4.05
98	2.87	14.69	11.83	5.18
99	1.88	15.68	13.79	6.10

RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.16	11.18	4.02	2.40
75	6.53	12.17	5.64	3.43
80	6.26	12.63	6.38	3.91
85	5.88	13.35	7.47	4.65
90	5.51	14.11	8.59	5.45
95	4.86	15.68	10.82	7.19
98	4.09	18.04	13.95	10.14
99	3.55	20.13	16.57	13.25

RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
60	7.25	11.92	4.67	4.96
75	6.64	13.42	6.79	8.72
80	6.38	14.22	7.84	11.27
85	6.03	15.62	9.60	16.89
90	5.69	17.37	11.68	25.62
95	5.10	22.67	17.56	64.13
98	4.42	41.40	36.98	265.18
99	3.97	93.72	89.75	937.45

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	13.72	25.77	12.04	4.64
90	12.80	28.84	16.04	6.18
95	12.07	32.02	19.95	7.69
98	11.30	36.40	25.10	9.68
99	10.83	40.01	29.17	11.25

APPENDIX E

STATISTICS FOR THE CONFIDENCE INTERVALS CALCULATED BY

THE CHI-SQUARED METHOD

The following statistics were calculated for the confidence intervals at each percentage of coverage:

1. the expected values of the upper and lower limits;
2. the expected value of the confidence interval widths, and
3. the standard deviation of the confidence interval widths.

The first line on each page gives the following information:

1. the queue property data that was used;
2. the queue parameters that were used;
3. the type of modification that was used, and
4. the type of data that was used (straight data or a combination of straight and antithetic data).

AVE WAITING TIMES EXP/EXP ORIG STRA 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	7.14	13.41	6.27	2.56
90	6.66	15.01	8.35	3.41
95	6.28	16.67	10.38	4.24
98	5.88	18.94	13.06	5.34
99	5.64	20.82	15.18	6.20

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	14.84	27.87	13.03	3.12
90	13.84	31.19	17.34	4.15
95	13.06	34.64	21.58	5.17
98	12.22	39.37	27.15	6.50
99	11.72	43.27	31.56	7.56

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	14.02	26.32	12.30	4.16
90	13.07	29.45	16.38	5.53
95	12.33	32.71	20.38	6.89
98	11.54	37.17	25.64	8.66
99	11.06	40.86	29.80	10.07

TING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
7.82	14.68	6.86	1.77
7.29	16.42	9.13	2.36
6.88	18.24	11.36	2.94
6.43	20.73	14.30	3.70
6.17	22.79	16.62	4.30

MAX WAITING TIMES EXP/EXP ORIG STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	14.90	27.98	13.08	2.90
90	13.90	31.32	17.42	3.86
95	13.11	34.78	21.67	4.80
98	12.27	39.53	27.26	6.04
99	11.76	43.45	31.68	7.02

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	7.57	14.21	6.64	1.19
90	7.06	15.90	8.84	1.58
95	6.65	17.65	11.00	1.97
98	6.23	20.07	13.84	2.48
99	5.97	22.05	16.08	2.88

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

CI%	EXPECTED VALUES LWR LIMT	EXPECTED VALUES UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	CONFDNCE INTRVL WIDTH STD DVTN
80	8.30	15.58	7.28	1.35
90	7.74	17.43	9.69	1.80
95	7.30	19.36	12.06	2.24
98	6.83	22.01	15.18	2.81
99	6.55	24.19	17.64	3.27

WAITING TIMES EXP/CONS ORIG STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

CI%	EXPECTED VALUES LWR LIMT	UPR LIMT	CONFDNCE INTRVL WIDTH EXPT VAL	STD DVTN
80	8.48	15.92	7.44	1.03
90	7.91	17.82	9.91	1.38
95	7.46	19.79	12.33	1.71
98	6.98	22.49	15.51	2.16
99	6.69	24.72	18.03	2.51

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	4.08	7.66	3.58	0.65
90	3.80	8.57	4.76	0.87
95	3.59	9.51	5.93	1.08
98	3.36	10.81	7.46	1.36
99	3.22	11.89	8.67	1.58

AVE WAITING TIMES EXP/CONS ORIG STRA/ANTI 19 JUL 72

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	4.14	7.77	3.63	0.55
90	3.86	8.69	4.83	0.74
95	3.64	9.65	6.01	0.92
98	3.40	10.97	7.57	1.15
99	3.26	12.06	8.79	1.34

STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMITS

RESULTS USING UNTRANSFORMED DATA SUBSETS

	EXPECTED VALUES		CONFDNCE INTRVL WIDTH	
CI%	LWR LIMT	UPR LIMT	EXPT VAL	STD DVTN
80	7.57	14.21	6.64	1.19
90	7.06	15.90	8.84	1.58
95	6.65	17.65	11.00	1.97
98	6.23	20.07	13.84	2.48
99	5.97	22.05	16.08	2.88

QUEUE SIMULATION PROGRAM

Queue Simulation Program Data Cards

The first three data cards are the seeds for the random number generator "Sunif" and are as follows (cards two and three must be double precision with eight numbers per card; see the computer program for the proper field spacings):

Card Number				
1.	1			
2.	0.11164363	0.21215978	0.10438445	0.36792262
	0.73944048	0.49563129	0.64208482	0.51486729
3.	0.99756264	0.71325552	0.65285972	0.17264573
	0.95639998	0.61555764	0.78137988	0.62490992

The following set of cards will make the queue simulation program generate a queue discipline that has exponential interarrival times and constant service times with a traffic intensity of 0.9. The output data will be based on the first five customers and will give 2000 realizations for the fifth customer. Two thousand straight and antithetic realizations will be generated for the following:

1. The waiting times of the fifth customer,
2. the average waiting times of the first five customers, and
3. the maximum waiting times of the first five customers.

These realizations will be both printed out on the line printer and punched out on cards. The punched data is arranged so that it can be used in the Jackknife and Chi-square programs. However, the cards separating the straight data from the antithetic data must be removed before the data is used in the two statistics programs.

Card Number				
4.	INTERARRIVAL TIMES	EXPO		0.1
5.	SERVICE TIMES	MISC FUNC		2
6.	10.0 0.0 10.0 1.0			
7.	5 2000 0.9			
8.	WAITING TIMES		PUNC STRA ANTI	
9.	AVERAGE WAITING TIMES		PUNC STRA ANTI	
10.	MAXIMUM WAITING TIMES		PUNC STRA ANTI	

To modify the above to give the EXP/EXP queue discipline, cards five and six must be replaced by the following card:

5.	SERVICE TIMES	EXPO FUNC	0.1

Note: All the alphameric inputs are left justified in their proper fields and all the numeric inputs are right justified in their proper fields.

```
      DIMENSION TYPET(2,5),DISTT(2),PARAM(2),DFUNC(2),DISPT(30,2,2),
     1DESCR(3,3),DISSTA(2,3,2),WT(2),AWT(2),BWT(2),T(2),CT(2,2),
     2DAT(3),R(2),DUM(30,2),ST(2),AT(2)
      REAL*8 DRR(16),RR2(16)
      COMMON RR(16),CWTD(2000,3,2),OTPDAT(3,5),NNN
      EQUIVALENCE (RR,DRR)
      DATA DMIS,EXP,FUNC/'MISC','EXPO','FUNC'/
      DATA DAT/'WAIT','AVER','MAXI'/
      DATA PUNC,STRA,ANTI/'PUNC','STRA','ANTI'/
      READ(5,1005) NNN
      READ(5,1000) (RR(I),I=1,16)
      N2=NNN
      DO 5 I=1,16
    5 RR2(I)=RR(I)
    8 DO 10 I=1,2
      READ(5,1010,END=125) (TYPET(I,J),J=1,5),DISTT(I),DFUNC(I),PARAM(I)
      IF(DISTT(I).NE.DMIS) GO TO 10
      N=PARAM(I)
      READ(5,1020) ((DISPT(J,K,I),K=1,2),J=1,N)
   10 CONTINUE
      READ(5,1030) NCUS,NRLZ,TI
      NOP=0
      DO 15 I=1,3
      READ(5,1040,END=18) (OTPDAT(I,J),J=1,5),(DESCR(I,J),J=1,3)
      NOP=NOP+1
   15 CONTINUE
   18 DO 20 I=1,2
      IF(DFUNC(I).EQ.FUNC) CALL FUNCT(TI,I,DISPT,DISTT,PARAM,DISSTA)
      IF(DFUNC(I).EQ.FUNC) GO TO 25
   20 CONTINUE
      CALL DSTAT(DISTT,PARAM,DISPT,DISSTA)
   25 WRITE(6,2000)
      DO 26 I=1,2
      WRITE(6,2010) (TYPET(I,J),J=1,5)
      IF(DISTT(I).EQ.EXP) WRITE(6,2020)
      IF(DISTT(I).EQ.DMIS) WRITE(6,2030)
      WRITE(6,2040) ((DISSTA(K,J,I),J=1,3),K=1,2)
   26 CONTINUE
      WRITE(6,2045) NCUS,TI,NRLZ
      IF(NOP.EQ.0) STOP
      NNN=N2
      DO 27 I=1,16
   27 RR(I)=RR2(I)
      DNCUS=NCUS
      DO 70 I1=1,NRLZ
      DO 29 I=1,2
      AT(I)=0.0
      ST(I)=0.0
```

```
      AWT(I)=0.0
   29 BWT(I)=0.0
      DO 60 M=2,NCUS
      DO 50 I=1,2
      R(1)=SUNIF(DD)
      R(2)=1-R(1)
      IF(DISTT(I).EQ.DMIS) GO TO 35
      DO 30 J=1,2
      A=R(J)
   30 CT(I,J)=-(1/PARAM(I))*ALOG(A)
      GO TO 50
   35 N=PARAM(I)
      DO 40 K=1,N
      DO 40 L=1,2
   40 DUM(K,L)=DISPT(K,L,I)
      CALL TIME (T,DUM,30,2,R)
      DO 45 J=1,2
   45 CT(I,J)=T(J)
   50 CONTINUE
      DO 55 I=1,2
      AT(I)=AT(I)+CT(1,I)
      ST(I)=ST(I)+CT(2,I)
      WT(I)=ST(I)-AT(I)
      IF(WT(I).LE.0.0) WT(I)=0.0
      AWT(I)=AWT(I)+(WT(I)/DNCUS)
      IF(WT(I).GT.BWT(I)) BWT(I)=WT(I)
   55 CONTINUE
   60 CONTINUE
      DO 65 J=1,2
      CWTD(I1,1,J)=WT(J)
      CWTD(I1,2,J)=AWT(J)
   65 CWTD(I1,3,J)=BWT(J)
   70 CONTINUE
      WRITE(6,2110) NNN
      WRITE(6,2120) (RR(I),I=1,16)
      CALL DATAST (NRLZ,NOP,NCUS)
      DO 115 J=1,NOP
      DO 75 I=1,3
      IF(OTPDAT(J,1).EQ.DAT(I)) GO TO (85,90,95),I
   75 CONTINUE
   85 WRITE(6,2050) NCUS
      IF(DESCR(J,1).EQ.PUNC) WRITE(7,2055) NCUS,NRLZ
      I=1
      GO TO 100
   90 WRITE(6,2060) NCUS
      IF(DESCR(J,1).EQ.PUNC) WRITE(7,2065) NCUS,NRLZ
      I=2
      GO TO 100
```

```
   95 WRITE(6,2070) NCUS
      IF(DESCR(J,1).EQ.PUNC) WRITE(7,2075) NCUS,NRLZ
      I=3
      GO TO 100
  100 IF(DESCR(J,2).NE.STRA) GO TO 110
      WRITE(6,2080)
      WRITE(6,2100) (CWTD(K,I,1),K=1,NRLZ)
      IF(DESCR(J,1).NE.PUNC) GO TO 110
      WRITE(7,2085)
      WRITE(7,2105) (CWTD(K,I,1),K=1,NRLZ)
  110 IF(DESCR(J,3).NE.ANTI) GO TO 115
      WRITE(6,2090)
      WRITE(6,2100) (CWTD(K,I,2),K=1,NRLZ)
      IF(DESCR(J,1).NE.PUNC) GO TO 115
      WRITE(7,2095)
      WRITE(7,2105) (CWTD(K,I,2),K=1,NRLZ)
  115 CONTINUE
      DO 120 I=1,16
  120 RR(I)=RR2(I)
      NNN=N2
      GO TO 8
  125 STOP
 1000 FORMAT(8F10.8)
 1005 FORMAT(I5)
 1010 FORMAT(5A4,5X,2(A4,1X),F5.0)
 1020 FORMAT(8F10.2)
 1030 FORMAT(2I5,F5.2)
 1040 FORMAT(5A4,5X,3(A4,1X))
 2000 FORMAT('1'////////50X,'STATISTICS FOR THE DISTRIBUTIONS')
 2010 FORMAT(/////56X,5A4)
 2020 FORMAT (//38X,'THIS CHARACTERISTIC TIME HAS AN EXPONENTIAL DISTRIB
     1UTION')
 2030 FORMAT (//38X,'THIS CHARACTERISTIC TIME HAS A MISCELANEOUS DISTRIB
     1UTION')
 2040 FORMAT(//61X,'STRAIGHT  ANTITHETIC  COMBINED'//40X,
     1'MEAN OF DIST',9X,3(F8.2,3X)//40X,
     2'VARIANCE OF DIST',5X,3(F8.2,3X))
 2045 FORMAT(//////57X,'INPUT PARAMETERS'////29X,'CUSTOMER NUMBER',
     110X,'TRAFFIC INTENSITY',10X,'NUMBER OF REALIZATIONS'//35X,I3,
     221X,F5.2,26X,I4////)
 2050 FORMAT('1',32X,'THE FOLLOWING OUTPUT IS FOR THE WAITING TIMES OF T
     1HE ',I2,'TH CUSTOMER'///)
 2055 FORMAT('WAITING TIMES; NCUS = ',I3,5X,'NRLZ = ',I4)
 2060 FORMAT('1',25X,'THE FOLLOWING OUTPUT IS FOR THE AVERAGE WAITING TI
     1MES OF THE FIRST ',I2,' CUSTOMERS'///)
 2065 FORMAT('AVERAGE WAITING TIMES; NCUS = ',I3,5X,'NRLZ = ',I4)
 2070 FORMAT('1',25X,'THE FOLLOWING OUTPUT IS FOR THE MAXIMUM WAITING TI
     1MES OF THE FIRST ',I2,' CUSTOMERS'///)
```

```
2075 FORMAT('MAXIMUM WAITING TIMES; NCUS = ',I3,5X,'NRLZ = ',I4)
2080 FORMAT(59X,'STRAIGHT DATA'//)
2085 FORMAT(33X,'STRAIGHT DATA')
2090 FORMAT(////58X,'ANTITHETIC DATA'//)
2095 FORMAT(32X,'ANTITHETIC DATA')
2100 FORMAT(200(16X,10(3X,F7.2)//))
2105 FORMAT(10F8.2)
2110 FORMAT(///////46X,'THE NEW SEED FOR SUNIF IS AS FOLLOWS'///15X,
    1'NNN = ',I2///)
2120 FORMAT(2(12X,8(3X,F10.8)//))
     END


     SUBROUTINE FUNCT (TI,ID,DISPT,DISTT,PARAM,DISSTA)
     COMMON RR(16),CWTD(2000,3,2),OTPDAT(3,5),NNN
     DIMENSION DISPT(30,2,2),DISTT(2),PARAM(2),DISSTA(2,3,2)
     DATA DMIS/'MISC'/
     N=PARAM(ID)
     A=TI+0.02
     B=TI-0.02
   5 CALL DSTAT (DISTT,PARAM,DISPT,DISSTA)
     TIE=DISSTA(1,3,1)/DISSTA(1,3,2)
     F=TI/TIE
     IF(TIE.LE.A.AND.TIE.GE.B) GO TO 20
     IF(TIE.GT.A) F=1/F
     IF(DISTT(ID).NE.DMIS) GO TO 15
     DO 10 I=1,N
  10 DISPT(I,1,ID)=F*DISPT(I,1,ID)
     GO TO 5
  15 PARAM(ID)=PARAM(ID)/F
     GO TO 5
  20 TI=TIE
     RETURN
     END


     SUBROUTINE DSTAT (DISTT,PARAM,DISPT,DISSTA)
     DIMENSION DISTT(2),PARAM(2),DISPT(30,2,2),DISSTA(2,3,2),D(200,2,2)
    1,DUM(30,2),T(2),R(2),X(200)
     COMMON RR(16),CWTD(2000,3,2),OTPDAT(3,5),NNN
     DATA DMIS/'MISC'/
     DO 30 L=1,2
     IF(DISTT(L).EQ.DMIS) GO TO 15
     DO 10 I=1,200
     RS=SUNIF(DD)
     RA=1-RS
     D(I,1,L)=-(1/PARAM(L))*ALOG(RS)
  10 D(I,2,L)=-(1/PARAM(L))*ALOG(RA)
```

```
      GO TO 30
   15 N=PARAM(L)
      DO 20 I=1,N
      DO 20 J=1,2
   20 DUM(I,J)=DISPT(I,J,L)
      DO 25 I=1,200
      R(1)=SUNIF(DD)
      R(2)=1-R(1)
      CALL TIME (T,DUM,30,2,R)
      D(I,1,L)=T(1)
   25 D(I,2,L)=T(2)
   30 CONTINUE
      DO 45 K=1,2
      DO 40 J=1,2
      DO 35 I=1,200
   35 X(I)=D(I,J,K)
      CALL STAT (E,V,X,200)
      DISSTA(1,J,K)=E
      DISSTA(2,J,K)=V
   40 CONTINUE
   45 CONTINUE
      DO 50 J=1,2
      DO 50 I=1,2
   50 DISSTA(I,3,J)=(DISSTA(I,1,J)+DISSTA(I,2,J))/2
      RETURN
      END


      SUBROUTINE TIME (T,DUM,NP,NR,RN)
      DIMENSION T(2),DUM(NP,2),RN(2)
      DO 15 I=1,NR
      N=2
    5 IF(RN(I).LE.DUM(N,2)) GO TO 10
      N=N+1
      GO TO 5
   10 T(I)=((DUM(N,1)-DUM(N-1,1))/(DUM(N,2)-DUM(N-1,2)))*(RN(I)-DUM(N-1,
     12))+DUM(N-1,1)
   15 CONTINUE
      RETURN
      END


      SUBROUTINE DATAST (NRLZ,NOP,NCUS)
      DIMENSION NMZ(6,2),X(2000),DATSTA(6,3,2),DAT(3)
      COMMON RR(16),CWTD(2000,3,2),OTPDAT(3,5),NNN
      DATA DAT/'WAIT','AVER','MAXI'/
      DO 50 J=1,NOP
      M1=2*J-1
```

```
      M2=2*J
      DO 40  K=1,2
      DO 10  I=1,NRLZ
   10 X(I)=CWTD(I,J,K)
      CALL SHELL (X,NRLZ)
      N=0
      DO 15  I=1,NRLZ
      IF(X(I).LE.0.0)  GO TO 20
   15 N=N+1
   20 NMZ(M1,K)=NRLZ
      NMZ(M2,K)=N
      DO 30  L=M1,M2
   30 CALL  STAT(DATSTA(L,K,1),DATSTA(L,K,2),X,NMZ(L,K))
   40 CONTINUE
      DO 45  L=1,2
      DO 45  K=M1,M2
   45 DATSTA(K,3,L)=(DATSTA(K,1,L)+DATSTA(K,2,L))/2
   50 CONTINUE
      DO 70  N=1,2
      WRITE(6,2040)
      DO 65  J=1,NCP
      K=2*J
      IF(N.EQ.1)  K=K-1
      DO 55  I=1,3
      IF(OTPDAT(J,1).EQ.DAT(I))  GO TO  (56,57,58),I
   55 CONTINUE
   56 WRITE(6,2050)  NCUS
      GO TO 60
   57 WRITE(6,2060)  NCUS
      GO TO 60
   58 WRITE(6,2070)  NCUS
   60 IF(N.EQ.1)  WRITE(6,2080)  (NMZ(K,I),I=1,2)
      IF(N.EQ.2)  WRITE(6,2085)  (NMZ(K,I),I=1,2)
      WRITE(6,2090)  ((DATSTA(K,L,M),L=1,3),M=1,2)
   65 CONTINUE
   70 CONTINUE
      RETURN
 2040 FORMAT('1'///////////////48X'STATISTICS  FOR  THE  QUEUE  PROPERTIES')
 2050 FORMAT(////30X,'THE  FOLLOWING  STATISTICS  ARE  FOR  THE  WAITING  TIMES
     1 OF  THE  ',I2,'TH  CUSTOMER')
 2060 FORMAT   (////24X,'THE  FOLLOWING  STATISTICS  ARE  FOR  THE  AVERAGE  WAI
     1TING  TIMES  OF  THE  FIRST  'I2,'  CUSTOMERS')
 2070 FORMAT   (////24X,'THE  FOLLOWING  STATISTICS  ARE  FOR  THE  MAXIMUM  WAI
     1TING  TIMES  OF  THE  FIRST  'I2,'  CUSTOMERS')
 2080 FORMAT  (/26X,'THE  FOLLOWING  VALUES  ARE  BASED  ON  ',I4,'  STRAIGHT  AN
     1D  ',I4,'  ANTITHETIC  REALIZATIONS')
 2085 FORMAT  (/22X,'THE  FOLLOWING  VALUES  ARE  BASED  ON  ',I4,'  STRAIGHT  AN
     1D  ',I4,'  ANTITHETIC  NON-ZERO  REALIZATIONS')
```

```
2090 FORMAT(/58X,'STRAIGHT',5X,'ANTITHETIC',5X,'COMBINED'//
    138X,'EXPECTED VALUE:',6X,3(F6.2,8X)/
    238X,'VARIANCE      :',5X,3(F7.2,7X))
     END

     SUBROUTINE SHELL (X,N)
     DIMENSION X(N)
     M=N
  10 M=M/2
     IF(M.EQ.0) RETURN
     K=N-M
     J=1
  20 I=J
  30 IM=I+M
     IF(X(I).GT.X(IM)) GO TO 40
     S=X(I)
     X(I)=X(IM)
     X(IM)=S
     I=I-M
     IF(I.GE.1) GO TO 30
  40 J=J+1
     IF (J .LE. K) GO TO 20
     GO TO 10
     END

     SUBROUTINE STAT(E,V,X,N)
     DIMENSION X(N)
     SX=0.0
     SDS=0.0
     DN=N
     DO 5 I=1,N
   5 SX=SX+X(I)
     E=SX/DN
     DO 10 I=1,N
  10 SDS=SDS+(X(I)-E)**2
     V=SDS/(DN-1)
     RETURN
     END

     FUNCTION SUNIF(D)
     COMMON RR(16),CWTD(2000,3,2),OTPDAT(3,5),NNN
     N1=NNN+1
     IF (N1 .GT. 16) N1=1
     RR(N1)=RR(N1)+RR(NNN)
     SUNIF=RR(N1)-1.
```

```
      NNN=N1
      IF (SUNIF) 30,40,40
   30 SUNIF=RR(N1)
      RETURN
   40 RR(N1)=SUNIF
      RETURN
      END
```

JACKKNIFE PROGRAM

Jackknife Program Data Cards

One set of input cards is characterized by two alphanumeric input data cards followed by the straight and antithetic realizations for that set. The first data card is used to head and label the output data (results) obtained from the program. The second data card gives both the variance of the realizations and the operations which are desired for the one set of realizations. The 2000 straight and the 2000 corresponding antithetic realizations obtained from the queue simulation program follow the first two alphameric data cards. This computer program is set up so that there must be 2000 straight and 2000 antithetic realizations in each set of data. Note: All the alphameric inputs are left justified in their proper fields and all the numeric inputs are right justified in their proper fields.

Example of the first data card

WAITING TIMES	EXP/EXP	19 JUL 72	CA LUSKY
(Columns 1-32)		(Columns 36-45)	(Columns 72-80)

Example of the second data card

318.92	ORIG REDF SCAN DELZ
(Columns 1-10)	(Columns 15-33)

```
      DIMENSION  DLM(400,3,8),ANS(4,3,8),D(2000,2),DCL(8,3),C(10,3),
     1DATHD(20),DMI(3),AS(3),DD(200),DS(11,2),NPER(8),OPR(4),DATAT(3),
     2OPERI(4)
      DATA DLM,NPER,NP/9600*1.,60,75,80,85,90,95,98,99,8/
      DATA E,V,UL,NT,NRLZ,NDP/0.,0.,0.,3,2000,10/
      DATA DMI,OPR/'STRA','CUBE','LOG ','SCAN','ORIG','DELZ','REDF'/
      DATA DATAT,BLK/'STRA','/ANT','I   ','    '/
      REAL LL
    1 READ(5,1020,END=160) (DATHD(I),I=1,20)
      READ(5,1030) A,(OPERI(I),I=1,4)
      READ(5,1025) ((D(I,J),I=1,NRLZ),J=1,2)
      A=A**0.5
      CALL CHSE (1,AS,DLM,DMI,A,NT,MTC,NP)
      NUMT=4
      DO 2 I=1,4
      IF(OPERI(I).EQ.BLK) NUMT=NUMT-1
    2 CONTINUE
      DO 155 NUM1=1,NUMT
      OPER=OPERI(NUM1)
      DO 3 I=1,4
      IF(OPER.EQ.OPR(I)) NOP=I
    3 CONTINUE
      DO 150 NUM2=1,2
      IF(NOP.EQ.3.AND.NUM2.EQ.2) GO TO 150
      DO 4 I=1,8
      DO 4 J=1,3
    4 DCL(I,J)=0.0
      NTC=0
      L=0
      NDS=NUM2
      DN=NDS
      NL=NDP
      MTC=NRLZ/NDP
      DO 45 L1=1,NRLZ,NDP
      DO 5 I=1,10
      DO 5 J=1,3
    5 C(I,J)=0.0
      DO 10 L2=1,NDS
      IF(NDS.EQ.2.AND.L2.EQ.2) L=L1-1
      DO 9 K=1,NDP
      L=L+1
    9 DS(K,L2)=D(L,L2)
   10 CONTINUE
      GO TO (12,14,13,14),NOP
   12 CALL SCAN (DS,NDP,NDS)
      GO TO 14
   13 CALL REDUCE (NL,DS,NDP)
      IF(NL.LE.2) GO TO 45
```

```
14 CALL JAKKNF (DS,NL,NDS)
   DO 25 K=1,NT
   DO 24 J=1,NDS
   A=DS(1,J)
   GO TO (17,15,16),K
15 A=A**0.333
   GO TO 17
16 A=ALOG(A)
17 DO 20 I=1,NL
   B=DS(I+1,J)
   GO TO (20,18,19),K
18 B=B**0.333
   GO TO 20
19 B=ALOG(B)
20 C(I,K)=C(I,K)+(NL*A-(NL-1)*B)/DN
24 CONTINUE
25 CONTINUE
   L2=NL
   IF(NDP.NE.4) GO TO 35
   DO 30 I=1,NL
30 DD(I)=C(I,1)
   CALL SHELL (DD,NL)
   J=NL-1
   DO 33 I=1,J
   IF(DD(I).EQ.DD(I+1)) L2=L2-1
33 CONTINUE
   IF(L2.LE.1) GO TO 45
35 MTC=MTC+1
   NTC=NTC+1
   DO 40 J=1,NT
   DO 36 I=1,NL
36 DD(I)=C(I,J)
   CALL STAT (E,V,DD,NL)
   DO 37 K=1,NP
   CALL TTEST (LL,UL,E,V,L2,NPER(K))
   IF(AS(J).GE.LL.AND.AS(J).LE.UL) DCL(K,J)=DCL(K,J)+1
   DLM(NTC,J,K)=LL
37 DLM(MTC,J,K)=UL
40 CONTINUE
45 CONTINUE
   CALL CHSE (2,AS,DLM,DMI,A,NT,MTC,NP)
   M=NRLZ/NDP
   DO 90 K=1,NP
   DO 85 J=1,NT
   DO 80 I=1,NTC
80 DD(I)=DLM(I+M,J,K)-DLM(I,J,K)
   CALL STAT (E,V,DD,NTC)
   ANS(1,J,K)=E
```

```
      ANS(2,J,K)=V**0.5
   85 CONTINUE
   90 CONTINUE
      DO 120 L=1,2
      M=1
      N=NTC
      IF(L.NE.2) GO TO 100
      M=(NRLZ/NDP)+1
      N=MTC
  100 DO 115 K=1,NP
      DO 110 J=1,NT
      L1=0
      DO 105 I=M,N
      L1=L1+1
  105 DD(L1)=DLM(I,J,K)
      CALL STAT (E,V,DD,L1)
  110 ANS(L+2,J,K)=E
  115 CONTINUE
  120 CONTINUE
      A=NTC
      P=A/100
      DO 125 I=1,NP
      DO 125 J=1,NT
      DCL(I,J)=DCL(I,J)/P
  125 C(I,J)=NPER(I)-DCL(I,J)
      NL=1
      WRITE(6,2010) NL
      WRITE(6,2025) (DATHD(I),I=1,7)
      WRITE(6,2026) OPER
      IF(NDS.EQ.1) WRITE(6,2027) DATAT(1)
      IF(NDS.EQ.2) WRITE(6,2027) (DATAT(I),I=1,3)
      WRITE(6,2028) (DATHD(I),I=10,12,1)
      WRITE(6,2030)
      DO 135 J=1,NT
      IF(J.EQ.1) WRITE(6,2100)
      IF(J.EQ.2) WRITE(6,2110)
      IF(J.EQ.3) WRITE(6,2120)
      WRITE(6,2040)
      DO 130 I=1,NP
      P=NPER(I)
  130 WRITE(6,2045) P,DCL(I,J),C(I,J)
  135 CONTINUE
      NL=NL+1
      WRITE(6,2010) NL
      WRITE(6,2025) (DATHD(I),I=1,7)
      WRITE(6,2026) OPER
      IF(NDS.EQ.1) WRITE(6,2027) DATAT(1)
      IF(NDS.EQ.2) WRITE(6,2027) (DATAT(I),I=1,3)
```

```
      WRITE(6,2029) (DATHD(I),I=10,12,1)
      WRITE(6,2050)
      DO 145 I=1,NT
      IF(I.EQ.1) WRITE(6,2100)
      IF(I.EQ.2) WRITE(6,2110)
      IF(I.EQ.3) WRITE(6,2120)
      WRITE(6,2055)
      DO 140 J=1,NP
  140 WRITE(6,2060) NPER(J),ANS(3,I,J),ANS(4,I,J),ANS(1,I,J),ANS(2,I,J)
  145 CONTINUE
  150 CONTINUE
  155 CONTINUE
      GO TO 1
  160 STOP
 1020 FORMAT(20A4)
 1025 FORMAT(10F8.2)
 1030 FORMAT(F10.2,4X,4(A4,1X))
 2010 FORMAT('1',120X,'PAGE ',I1,'/2'////)
 2015 FORMAT(//////////26X,20A4///)
 2020 FORMAT(26X,20A4/)
 2025 FORMAT('+',35X,7A4)
 2026 FORMAT('+',65X,A4)
 2027 FORMAT('+',73X,3A4)
 2028 FORMAT('+',85X,3A4/)
 2029 FORMAT('+',86X,3A4/)
 2030 FORMAT(39X,'STATISTICS ON THE COVERAGE USING THE JACKKNIFE METHOD'
     1)
 2040 FORMAT(/47X,'PERCENTAGE OF COVERAGE'/46X
     1'T-TABLE PRED.',5X,'ACTUAL',5X,'DIFFERENCE'/)
 2045 FORMAT(50X,F4.1,11X,F4.1,8X,F5.1/)
 2050 FORMAT(38X,'STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMI
     1TS')
 2055 FORMAT(/47X,'EXPECTED VALUES',11X,'CONFDNCE INTRVL WIDTH'/
     137X,'CI%',4X,'LWR LIMT',5X,'UPR LIMT',8X,'EXPT VAL',5X'STD DVTN'/)
 2060 FORMAT(37X,I2,2(5X,F8.2),8X,F8.2,4X,F9.2/)
 2100 FORMAT(//44X,'RESULTS USING UNTRANSFORMED JACKKNIFED DATA')
 2110 FORMAT(//40X,'RESULTS USING CUBE ROOT TRANSFORMED JACKKNIFED DATA'
     1)
 2120 FORMAT(//41X,'RESULTS USING LOGGED TRANSFORMED JACKKNIFED DATA')
      END

      SUBROUTINE STAT (E,V,X,N)
      DIMENSION X(N)
      SX=0.0
      SDS=0.0
      DN=N
      DO 5 I=1,N
```

```
 5 SX=SX+X(I)
   E=SX/DN
   DO 10 I=1,N
10 SDS=SDS+(X(I)-E)**2
   V=SDS/(DN-1)
   RETURN
   END

   SUBROUTINE SHELL (X,N)
   DIMENSION X(N)
   M=N
10 M=M/2
   IF(M.EQ.0) RETURN
   K=N-M
   J=1
20 I=J
30 IM=I+M
   IF(X(I).LE.X(IM)) GO TO 40
   S=X(I)
   X(I)=X(IM)
   X(IM)=S
   I=I-M
   IF(I.GE.1) GO TO 30
40 J=J+1
   IF (J .LE. K) GO TO 20
   GO TO 10
   END

   SUBROUTINE JAKKNF (DS,NL,NDS)
   DIMENSION DS(11,2),S(10),X(10)
   DO 25 L=1,NDS
   DO 5 M=1,NL
 5 S(M)=DS(M,L)
   CALL STAT (E,V,S,NL)
   DS(1,L)=V**0.5
   DO 20 I=1,NL
   J=1
   K=0
10 IF(J.EQ.I) J=J+1
   IF(J.GT.NL) GO TO 15
   K=K+1
   X(K)=S(J)
   J=J+1
   GO TO 10
15 CALL STAT (E,V,X,K)
   DS(I+1,L)=V**0.5
```

```
20 CONTINUE
25 CONTINUE
   RETURN
   END

   SUBROUTINE SCAN (X,N,ND)
   DIMENSION X(N,2),XD(10)
   DO 20 J=1,ND
   NZ=0
   L=0
   DO 10 I=1,N
   IF(X(I,J).EQ.0) GO TO 5
   L=L+1
   XD(L)=X(I,J)
   GO TO 10
 5 NZ=NZ+1
10 CONTINUE
   IF(NZ.EQ.0) RETURN
   CALL SHELL (XD,L)
   A=XD(1)
   L=0
   DN=NZ+1
   DO 15 I=1,N
   IF(X(I,J).NE.0) GO TO 15
   L=L+1
   DL=L
   X(I,J)=(DL*A)/DN
15 CONTINUE
20 CONTINUE
   RETURN
   END

   SUBROUTINE REDUCE (L,D,N)
   DIMENSION D(N,2)
   L=0
   DO 5 I=1,N
   IF(D(I,1).LE.0.0) GO TO 5
   L=L+1
   D(L,1)=D(I,1)
 5 CONTINUE
   RETURN
   END
```

```
      SUBROUTINE TTEST (BL,TL,E,V,ND,NTP)
      DIMENSION NP(8),TTABL(10,8)
      DATA TTABL/1.376,1.061,0.978,0.941,0.920,0.906,0.896,0.889,0.883,
     10.879,2.414,1.604,1.423,1.344,1.301,1.273,1.254,1.240,1.230,1.221,
     23.078,1.886,1.638,1.533,1.476,1.440,1.415,1.397,1.383,1.372,4.701,
     32.403,1.960,1.832,1.745,1.691,1.650,1.628,1.608,1.592,6.341,2.920,
     42.353,2.132,2.015,1.943,1.895,1.860,1.833,1.812,12.706,4.303,
     53.182,2.776,2.571,2.447,2.365,2.306,2.262,2.228,31.821,6.965,
     64.541,3.747,3.365,3.143,2.998,2.896,2.821,2.746,63.657,9.925,
     75.841,4.604,4.032,3.707,3.499,3.355,3.250,3.169/
      DATA NP/800,875,900,925,950,975,990,995/
      D=ND
      N=ND-1
      NT=500+5*NTP
      DO 10 I=1,8
      IF(NT.EQ.NP(I)) GO TO 15
   10 CONTINUE
   15 T=TTABL(N,I)
      FF=T*((V/D)**0.5)
      BL=E-FF
      TL=E+FF
      RETURN
      END


      SUBROUTINE CHSE (N,AS,DLM,DMI,A,NT,MTC,NP)
      DIMENSION DLM(400,3,8),DMI(3),DMD(3),AS(3)
      DATA DMD/'STRA','CUBE','LOG '/
      GO TO (100,200),N
  100 DO 10 I=1,NT
      DO 5 J=1,3
      IF(DMI(I).EQ.DMD(J)) GO TO (9,6,8),J
    5 CONTINUE
    6 AS(I)=A**0.333
      GO TO 10
    8 AS(I)=ALOG(A)
      GO TO 10
    9 AS(I)=A
   10 CONTINUE
      RETURN
  200 DO 40 J=1,NT
      DO 15 M=1,3
      IF(DMI(J).EQ.DMD(M)) GO TO (40,20,30),M
   15 CONTINUE
   20 DO 25 K=1,NP
      DO 25 I=1,MTC
   25 DLM(I,J,K)=DLM(I,J,K)**3
      GO TO 40
```

```
30 DO 35 K=1,NP
   DO 35 I=1,MTC
   A=DLM(I,J,K)
35 DLM(I,J,K)=EXP(A)
40 CONTINUE
   RETURN
   END
```

CHI-SQUARE PROGRAM

This program is arranged similarly to the jackknife program as far as input data is concerned. The only change is on the second data card.

Example of the second data card

318.92	ORIG
(Columns 1-10)	(Columns 15-18)

```
      DIMENSION DLM(400,5),ANS(4,5),D(2000,2),DCL(5),C(10),DATAT(3),
     1DATHD(20),DD(200),NPER(5),DX(10,2),X(10)
      DATA DATAT,ORIG/'STRA','/ANT','I   ','ORIG'/
      DATA NPER,NP/80,90,95,98,99,5/
      DATA E,V,UL,NRLZ/0.,0.,0.,2000/
      REAL LL
    1 READ(5,1020,END=160) (DATHD(I),I=1,20)
      READ(5,1030) A,OPER
      READ(5,1025) ((D(I,J),I=1,NRLZ),J=1,2)
      A=A**0.5
      DO 150 NUM2=1,2
      NDP=10
      L=0
      NTC=0
      MTC=NRLZ/NDP
      NDS=NUM2
      DN=NDS
      DO 2 I=1,5
    2 DCL(I)=0.0
      DO 5 I=1,5
      DO 5 J=1,400
    5 DLM(J,I)=1.0
      DO 40 L1=1,NRLZ,NDP
      CV=0.0
      DO 15 J=1,NDS
      IF(J.EQ.2) L=L1-1
      DO 10 I=1,NDP
      L=L+1
      DX(I,J)=D(L,J)
   10 CONTINUE
   15 CONTINUE
      MTC=MTC+1
      NTC=NTC+1
      DO 25 J=1,NDS
      N=0
      DO 20 I=1,NDP
      N=N+1
      X(I)=DX(I,J)
   20 CONTINUE
      CALL STAT(E,V,X,N)
      CV=(V/DN)+CV
   25 CONTINUE
      DO 30 K=1,NP
      CALL CHISQT(LL,UL,CV,NDP,NPER(K))
      IF(A.GE.LL.AND.A.LE.UL) DCL(K)=DCL(K)+1
      DLM(NTC,K)=LL
      DLM(MTC,K)=UL
   30 CONTINUE
```

```
   40 CONTINUE
      M=NRLZ/NDP
      DO 90 K=1,NP
      DO 80 I=1,NTC
   80 DD(I)=DLM(I+M,K)-DLM(I,K)
      CALL STAT (E,V,DD,NTC)
      ANS(1,K)=E
      ANS(2,K)=V**0.5
   90 CONTINUE
      DO 120 L=1,2
      M=1
      N=NTC
      IF(L.NE.2) GO TO 100
      M=(NRLZ/NDP)+1
      N=MTC
  100 DO 115 K=1,NP
      L1=0
      DO 105 I=M,N
      L1=L1+1
  105 DD(L1)=DLM(I,K)
      CALL STAT (E,V,DD,L1)
      ANS(L+2,K)=E
  115 CONTINUE
  120 CONTINUE
      DA=NTC
      P=DA/100.0
      DO 125 I=1,NP
      DCL(I)=DCL(I)/P
  125 C(I)=NPER(I)-DCL(I)
      NL=1
      NDP=1
      IF(NDS.EQ.2) NDP=3
      WRITE(6,2010) NL
      WRITE(6,2110) (DATHD(I),I=1,7)
      WRITE(6,2120) OPER
      WRITE(6,2130) (DATAT(I),I=1,NDP)
      WRITE(6,2140) (DATHD(I),I=10,12)
      WRITE(6,2030)
      WRITE(6,2100)
      WRITE(6,2040)
      DO 130 I=1,NP
      P=NPER(I)
  130 WRITE(6,2045) P,DCL(I),C(I)
      NL=NL+1
      WRITE(6,2010) NL
      WRITE(6,2110) (DATHD(I),I=1,7)
      WRITE(6,2120) OPER
      WRITE(6,2130) (DATAT(I),I=1,NDP)
```

```
      WRITE(6,2140) (DATHD(I),I=10,12)
      WRITE(6,2050)
      WRITE(6,2100)
      WRITE(6,2055)
      DO 140  J=1,NP
  140 WRITE(6,2060) NPER(J),ANS(3,J),ANS(4,J),ANS(1,J),ANS(2,J)
  150 CONTINUE
      GO TO 1
  160 STOP
 1020 FORMAT(20A4)
 1025 FORMAT(10F8.2)
 1030 FORMAT(F10.2,4X,A4)
 2010 FORMAT('1',120X,'PAGE ',I1,'/2'////)
 2030 FORMAT(37X,'STATISTICS ON THE COVERAGE USING THE CHISQUARE PERCENT
     1AGES'/)
 2040 FORMAT(/47X,'PERCENTAGE OF COVERAGE'/45X
     1'CHI-TABLE PRED.',4X,'ACTUAL',5X,'DIFFERENCE'/)
 2045 FORMAT(50X,F4.1,11X,F4.1,8X,F5.1/)
 2050 FORMAT(38X,'STATISTICS FOR THE CONFIDENCE INTERVAL WIDTHS AND LIMI
     1TS'/)
 2055 FORMAT(/47X,'EXPECTED VALUES',11X,'CONFDNCE INTRVL WIDTH'/
     137X,'CI%',4X,'LWR LIMT',5X,'UPR LIMT',8X,'EXPT VAL',5X,'STD DVTN'/
     2)
 2060 FORMAT(37X,I2,2(5X,F8.2),8X,F8.2,4X,F9.2/)
 2100 FORMAT(//45X,'RESULTS USING UNTRANSFORMED DATA SUBSETS')
 2110 FORMAT(//36X,7A4)
 2120 FORMAT('+',67X,A4)
 2130 FORMAT('+',75X,3A4)
 2140 FORMAT('+',87X,3A4//)
      END


      SUBROUTINE STAT(E,V,X,N)
      DIMENSION X(N)
      SX=0.0
      SDS=0.0
      DN=N
      DO 5  I=1,N
    5 SX=SX+X(I)
      E=SX/DN
      DO 10 I=1,N
   10 SDS=SDS+(X(I)-E)**2
      V=SDS/(DN-1)
      RETURN
      END
```

```
      SUBROUTINE CHISQT (BL,UL,V,NL,NP)
      DIMENSION CSQT(10,10),NPER(5)
      DATA NPER/80,90,95,98,99/
      DATA CSQT/2.71,4.61,6.25,7.78,9.24,10.6,12.0,13.4,14.7,16.0,
     10.0158,0.211,0.584,1.06,1.61,2.20,2.83,3.49,4.17,4.87,
     23.84,5.99,7.81,9.49,11.1,12.6,14.1,15.5,16.9,18.3,
     30.00393,0.103,0.352,0.711,1.15,1.64,2.17,2.73,3.33,3.94,
     45.02,7.38,9.35,11.1,12.8,14.4,16.0,17.5,19.0,20.5,
     50.000982,0.0506,0.216,0.484,0.831,1.24,1.69,2.18,2.70,3.25,
     66.63,9.21,11.3,13.3,15.1,16.8,18.5,20.1,21.7,23.2,
     70.000157,0.0201,0.115,0.297,0.554,0.872,1.24,1.65,2.09,2.56,
     87.88,10.6,12.8,14.9,16.7,18.5,20.3,22.0,23.6,25.2,
     90.0000393,0.010,0.0717,0.207,0.412,0.676,0.989,1.34,1.73,2.16/
      K=NL-1
      VN=K*V
      DO 5  I=1,8
      IF(NP.EQ.NPER(I)) GO TO 10
    5 CONTINUE
   10 I=2*I
      BL=(VN/CSQT(K,I-1))**0.5
      UL=(VN/CSQT(K,I))**0.5
      RETURN
      END
```

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ABSTRACT
In many situations it is important to have a continuous flow of supplies from a storage point to a consumer. Often, though, queues develop and the flow of supplies is interrupted. To investigate these queue problems the statistics concerning various queue properties may be studied by computer simulation. To obtain accurate statistical information many realizations for each queue property must be obtained. Because of this, it may be costly to use queue simulations and computers to study these problems. However, by using straight-forward and antithetic sampling techniques in a queue simulation, the number of realizations needed to obtain accurate confidence interval estimates for the population standard deviation (σ_p) was reduced. By using a combination of ten straight and ten corresponding antithetic realizations, repeated testing of confidence intervals determined by both the jackknife and chi-square procedures showed that the predicted percentage of coverage of σ_p for the various queue properties could be obtained to a satisfactory approximation.

KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
1. Queue simulation						
2. Jackknife method for placing confidence intervals about the standard deviation of a population						
3. Chi-square method for placing confidence intervals about the standard deviation of a population						
4. Statistics						
5. Standard-deviation, confidence intervals						
6. T-test						
7. Chi-square statistic						

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